PACKAGE engineering

How to specify collapsible tube printing

Citing six rules that guide the basic requirements for optimum performance of tube printing and explain the supplier's manufacturing art in relation to user performance requirements. (See page 19)

Why not split packaging into departments?

After considering establishment of a company-wide packaging "pool" department, a seasoned production manager decided to keep his group of separate departments — within his packaging organization. (See page 38)

Machinery-material performance pointers

Stressing the need of quickly spotting package deviations and relating them to machine adjustments and practical techniques leading to high-speed production of uniform packages. (See page 44)

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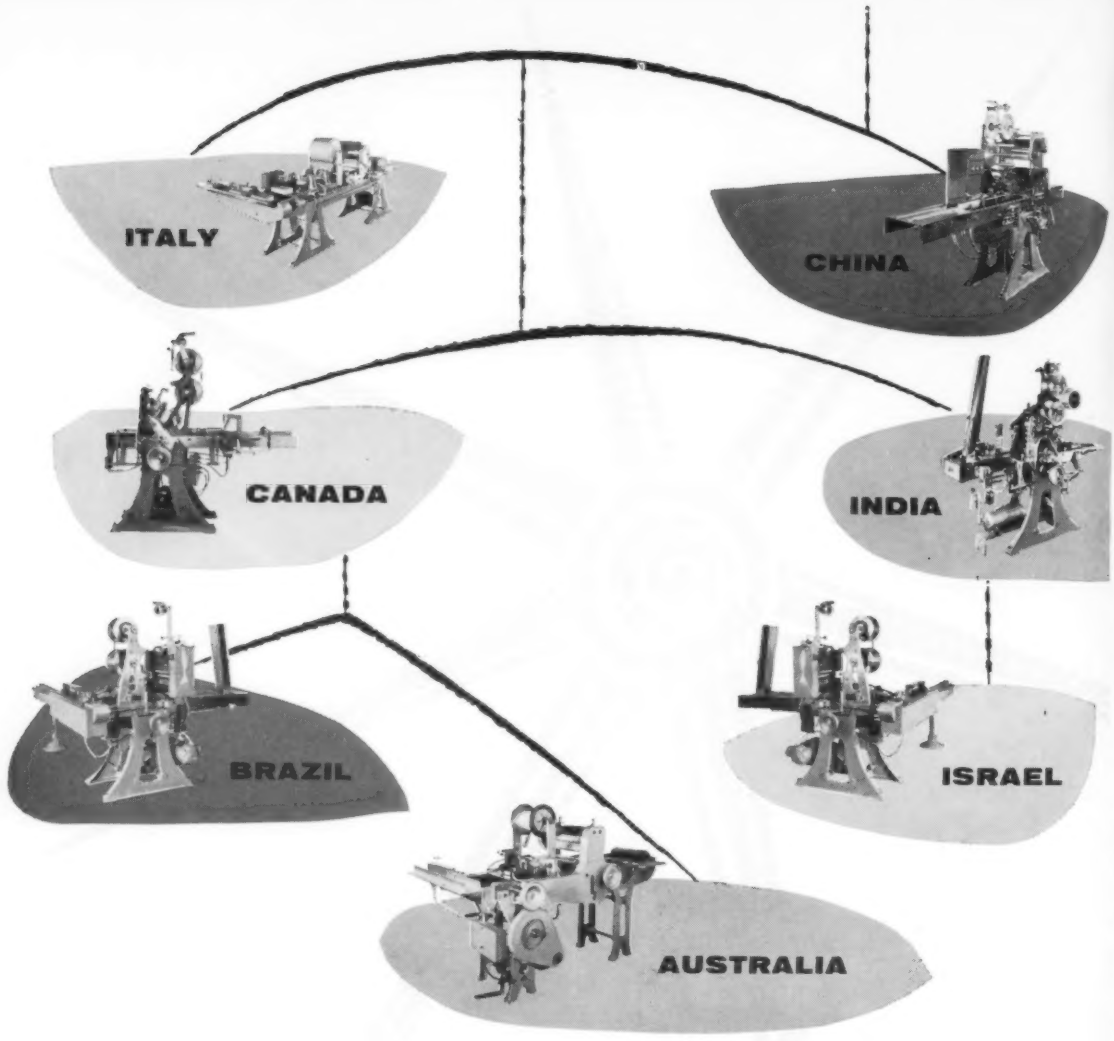

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Aluminum Foil Packaging–Cook-In Packages

Report No. 16 of a Series by Reynolds Metals Company

COOK-IN or heat-in packages of aluminum foil (which also double as "serve-in" packages) are receiving increasing attention in the food industry. They are used or adaptable for fresh and frozen vegetables; fresh, frozen, cured and prepared meats, poultry and seafood; soups, casserole dishes and complete dinners; baked, unbaked and brown-and-serve bakery products. The interest, of course, stems from consumer convenience and greatly enhanced sales appeal. But the food processor may also realize important economies in packing, cooking and freezing in the same container, often with savings in space and shipping weight.

Housewives are thoroughly familiar with cooking in aluminum foil through their own Reynolds Wrap "packaging" of meats and poultry. Test results illustrate the culinary advantages of this method. Two 12 lb. 10 oz. turkeys were roasted, one with and one without such wrapping. Both were cooked until well done; both were excellent in appearance. But an expert taste panel judged the Reynolds-Wrapped turkey superior in flavor, its meat more moist. And cooking time was halved... the unwrapped bird requiring 3 hr. 55 min. at the usual 300°F, while the other cooked in aluminum foil at 450°F for only 1 hr. 55 min.

Many of aluminum's advantages have been documented earlier in this series. If the product is frozen, aluminum will speed its freezing and keep it colder (Report No. 9). Aluminum helps preserve both vitamins and flavor (Reports No. 14 and 15). It protects against moisture gain or loss, air, light and odors (Reports No. 2, 3, 4 and 6). It extends storage and shelf life for many perishables. Aluminum itself is odorless, tasteless and non-toxic. And, unlike any other flexible packaging material, aluminum foil withstands extreme oven and stove temperatures without damage (Report No. 11).

Foil Laminated Materials

Important, too, is the fact that aluminum protects the less heat-resistant materials with which it may be laminated. This is due to its extremely high thermal conductivity—0.52 cal. per sec. per cm. per $cm.^2$ per °C. The effect is best explained by considering a cook-in package containing a normally moist food product.

Actual temperature within the cooking food—regardless of oven temperature—is limited by its contained moisture to the boiling point. If the package is a poor conductor, however, its outside temperature must be much greater to provide adequate heat flow. Further, if there is not intimate contact with the contents, hot spots will develop. Package temperatures will then approach oven temperature, often 400° to 450°F and damage can ensue.

But when highly conductive aluminum foil is one of the components, package temperature will remain much lower and still maintain sufficient heat flow. The aluminum will also eliminate hot spots by quickly conducting away excess localized heat. Thus the temperature of the packaging will approximate that of the contents. The laminating materials—paper, plastic film, etc.—will resist burning, charring, and melting. And their benefits—such as greater tear-resistance, heat-sealability, etc.—will be available where cook-in conditions would otherwise prevent their use.

Develop New Package

This has led to the development of a significant new type of laminated foil package—a *heat-sealed* pouch for *broiling* or *baking* ready-to-cook frozen fish fillets, chops, steaks, patties and similar foods. A tear strip removes the top portion of the pouch to expose contents for cooking while the remainder serves as a broiling and serving pan.

Thus aluminum foil continues to extend the range of cook-in packages. They are now available—either in plain foil or laminated combinations—for cooking or heating in the oven, under the broiler, in boiling water, on the grill, directly on stove burners and over charcoal fires. For further information on this or any phase of aluminum foil packaging, call your Reynolds representative or write **Reynolds Metals Company,** Richmond 18, Virginia.

★ ★ ★

Cook-in package types include pouches, Reynolds Cass-Rol Pak, Reynolds Pak, Reynolds Wrap Pak and Compartmented Tray. Plain foil wraps are also used as cook-in packages.

Watch Reynolds All-Family Television Program "DISNEYLAND", ABC-TV.

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JULY 1958 • VOLUME 3 • NUMBER 7

PACKAGE engineering

AN ANGUS J. RAY PUBLICATION

For your calendar

August 11-13. Western Packaging & Materials Handling Exposition, San Francisco Civic Auditorium. Contact: Exposition Office, 759 Monadnock Building, San Francisco 5, California. *Telephone: Douglas 2-7876.*

September 7-20. First Annual Packaging Conference, Industrial Management Center, Lake Placid Club, Essex County, New York. Contact: James R. Bright, Industrial Management Center, 56C Robbins Road, Lexington, Massachusetts.

September 15-17. AMA Clinic on Polyethylene, Hotel Astor, New York City. Contact: E. King Graves, American Management Association, 1515 Broadway, New York 36, New York. *Telephone: Judson 6-8100.*

September 30, Oct. 1-2. Fourth Joint Military-Industry Packaging and Materials Handling Symposium, sponsored by the Department of the Navy in cooperation with other military departments and the Department of Commerce, in Washington, D.C. Contact: Head, Packaging Section, Supply Programs Division, Office of Naval Material, Washington 25, D.C. *Telephone: Liberty 5-6700, Ext. 61061.*

October 13-15. Packaging Institute, 20th Annual Forum, Edgewater Beach Hotel, Chicago, Illinois. Contact: Charles A. Feld, executive director, Packaging Institute, 342 Madison Avenue, New York 17, New York. *Telephone: Murray Hill 7-8875.*

October 14-16. Society of Industrial Packaging and Materials Handling Engineers, 13th National Industrial Packaging and Handling Exposition, and SIPMHE short course, Chicago Coliseum, Chicago, Illinois. Contact: C. J. Carney, managing director, Society of Industrial Packaging and Materials Handling Engineers, Suite 1534, 14 E. Jackson Blvd., Chicago 4, Illinois. *Telephone: Harrison 7-6123.*

October 27-29. AMA Clinic on Packaging For Truck Fleet Operations, Hotel Astor, New York City. Contact: E. King Graves, American Management Association, 1515 Broadway, New York 36, New York. *Telephone: Judson 6-8100.*

Articles

19 Printing of collapsible tubes, by Mark K. Dresden, president, A. H. Wirz, Inc.

Reviewing six basic rules contributing to optimum performance of tube printing and presenting an explanation of fine points of the supplier's manufacturing art that a user should understand to successfully prepare tube printing specifications.

23 A close look at polystyrene film, by R. J. McCormick, plastics technical service, The Dow Chemical Company

Concluding part of a two-part article—discussing four methods of orienting the film, the physical properties of oriented polystyrene film, its fabrication and conversion, as well as its cost and specific applications in the packaging field.

38 Packaging management: The case for separate departments, by Lee H. Wellock, production manager, The Columbus Pharmacal Company

A review of practical experience and informed opinion on the question of assigning all packaging workers to a single department, versus having a series of specialized packaging departments within a plant—and concluding that the separate departments are preferable.

44 Correcting the causes of package defects, by Lawrence E. Eisen, superintendent of processing, Reliable Packing Company

Emphasizing the importance of quickly spotting deviations in completed packages and relating them to machinery adjustments and performance, with emphasis on the practical methods of getting high-speed production of packages of uniform quality and appearance.

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Reader Service Card inside back cover

Our December 1958 issue will carry a cumulative editorial index for the year listing our feature articles by subject, author, and other headings.

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PACKAGE engineering

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A note from the Publisher

A good many years ago, so the story goes, the chemist, John Hyatt, cut his finger. When he went for the bottle of collodion, he found it had spilled and its contents had hardened on the shelf. From observations and experiments based on this incident, Hyatt went on to make celluloid, the first synthetic plastic, and so started the tremendous plastics industry.

That plastics—and chemistry—are here to stay in the packaging field was certainly demonstrated at the National Packaging Show held the last week in May. The "miracle" plastics of a few years ago have been modified and combined with everything from steel to corrugated to do various packaging jobs better. The show stoppers of a year or so ago are taken for granted now as all packagers continue their search for better ways to do their packaging. The size and complexity of the show amply made clear that there are some surprises in store for anyone in the packaging field who thinks that the last word has been said on any phase of packaging.

Over 35,000 people went through the show during the five days it was held, and Clapp & Poliak did a remarkable job of organizing and getting the traffic through all four floors of the Coliseum. The second day, when 14,000 people registered, I couldn't help but think what a far cry this show was from the last time it was held in New York 15 years ago, and the unbelievable progress packaging has made in the ensuing 15 years.

The $2.00 admission charge did not hurt the attendance and certainly kept the "tourists" out. The funds realized from this admission charge are to be distributed between exhibitors and various educational institutions with packaging subjects as part of their curriculum.

To date the only grant announced has been to Wayne University in Detroit. Michigan State University belongs on this list. It is the only school sponsoring a four-year course in packaging and has been one of the pioneers in packaging education.

Certainly Michigan State has done a great deal to further the cause of packaging and if any school deserves the support of those in the packaging field, it does.

The need for more professionally trained packaging men is great and nowhere is this made clearer than in the growth of this AMA-sponsored packaging show. I urge the AMA to follow through on its original plan to establish a chair in Packaging Research at Michigan State.

Angus J. Ray
Publisher

Package Engineering is published monthly by Angus J. Ray Publishing Co., 185 North Wabash Avenue, Chicago 1, Illinois. Angus J. Ray, president; R. B. Holmgren and I. F. Megargee, vice presidents; James G. Culbertson, secretary and Ethyl K. Ray, treasurer. Please address articles for publication and correspondence regarding the editorial content to the editor. Statements and opinions expressed in articles and editorials are those of the respective authors, for which Package Engineering assumes no responsibility. Copyright 1958 by Angus J. Ray Publishing Company. Accepted as controlled circulation publication at Pontiac, Illinois. The name Package Engineering is registered in the U. S. Patent Office.

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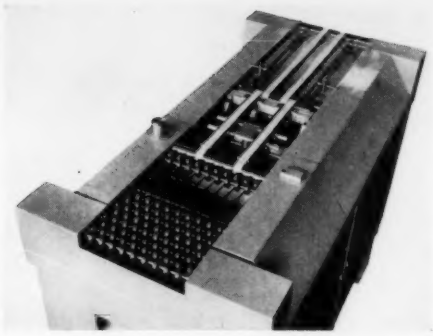

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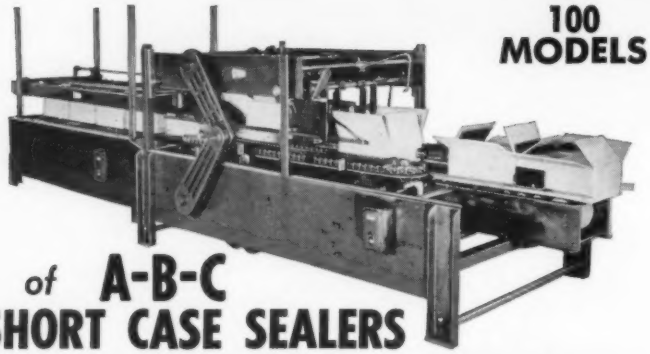

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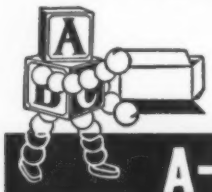

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REPRESENTATIVES IN PRINCIPAL CITIES

Letters to PACKAGE engineering

Re: Should the "experts" by-pass Purchasing?

Gentlemen:

Have read with interest your editorial in the June issue.

If the situation as covered, generally exists, then the point is well taken. However, speaking from experience, which I limit to our own method of operation, I would be missing a point if I neglected to offer that your comments appear grossly exaggerated.

A smooth flow and exchange of ideas between "new product and package development" and purchasing is not only a beneficial procedure, but a necessary one which the non-technical purchasing man has long since realized.

It is therefore very difficult to conceive that a buyer whether in the field of packaging, mill supplies, or ingredient raw materials would render any decision for his company if the lack of knowledge, (technical or common), did not qualify him to render such a decision.

E. Taylor
Packaging Buyer
The Nestlé Company, Inc.
White Plains, New York

We are glad to know that our comments are exaggerated in so far as they apply to your operation. We suspect a good many companies wish they could say the same. It is too bad that the lines of communication between technical packaging specialists and the purchasing people are not as articulate and as unobstructed as yours seem to be. The sheer complexity of large organizations often compartmentalizes different divisions and impairs communications.

Gentlemen:

Your editorial on "Should the

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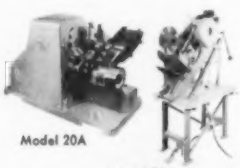
YOU CAN DEPEND ON DOW

Get better looking, lower cost package identification and decoration with a MARKEM METHOD

Hand stamping, using decals, stenciling — such methods can not only reduce the attractiveness and sales appeal of your package, but consume valuable time as well. "Outside printing" requires large inventories . . . causes waste from obsolescence . . . can result in production delays as well. The time and money saving way around these obstacles — with added quality besides — is a Markem Method working in your plant. This is a combination of the right *machine, type* and *specialty ink* to *identify* or *decorate your packages* at the *rate you need, as you need them.* Whether you want to screen decorate designs on molded plastics . . . print pressure sensitive tape with product name, trademark and directions for use . . . imprint variables on bakery labels, set-up or flat folding boxes, lithographed cans or lids — there's Markem equipment and a proven method for the job. The two machines shown are typical of more than a dozen used in the packaging field; type-wheels, or masterplates and typebars, make imprint changes fast, easy; 10,000 currently available specialty inks offer virtually any combination of color, drying speed and special property you want. In many cases, Unitized Markem printing heads can be combined with packaging equipment.



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'experts' by-pass Purchasing" is one of great interest and a quite argumentative subject. However, if we properly consider the facts in their true light, a second approach may be established for the good of the company.

It is my firm belief that any and all outside contact with suppliers should originate with the purchasing department. In cases where this is properly exercised, the channels of information arrange meetings. Or, visiting demonstrative exhibitions could be done coherently and with good judgment.

In other words, if purchasing serves this function where they have packaging with qualified personnel under their wing or in another department, the soundness of good business starts with the right selection of suppliers, reliable in performance, satisfactory quality, and at a fair price. In permitting segregation of privileges and responsiblities, the orderly use of channels becomes complex in its operation.

In conclusion, it is my opinion that as long as packaging development is constantly advised and if the decision is reached to make a deal, the best deal can be made by the purchasing executive who knows about it beforehand and can develop the "pros" and "cons" of a good purchase price.

George Berman
Purchasing Agent
Continental Distilling Corp.
Philadelphia

We are glad to see the distinction noted between the technical purchasing function and the technical packaging function. Perhaps it is a question of each respecting the other's ability in a foreign field. It is gratifying to see the emphasis that you place on keeping the packaging people properly advised of new developments. Your mention of demonstrative exhibitions stresses the importance of on-the-spot or three dimensional analysis prior to specifying packaging equipment or components.

For more information circle No. 208 on Reader Service Card
For more information circle No. 209 on Card

U.S.I. POLYETHYLENE NEWS

A series for plastics and packaging executives by the makers of PETROTHENE® polyethylene resins

JULY—AUGUST

Packaging Notes

Drawstring for Poly Bag has enabled one produce packer to cut labor costs and increase packing speeds 15 per cent. The drawstring runs through a strong, heat-sealed hem on 5-lb. bags of 2 mil polyethylene film. The closure is strong enough for the string loops to be hung on overhead conveyors or used by customers as a convenient carrying handle. The bags require less film to fabricate than do tied-top bags and they are claimed to be easier to fill. Produce shippers have expressed interest in the drawstring poly bag for packing potatoes and citrus fruit.

Polyethylene Bottle Closure with expandable plug is designed to prevent movement and breakage of pills during shipping and use. The patented closure replaces the usual cotton pad or paper insert ordinarily used with tablet containers.

The polyethylene insert is constructed to double up when the cap is screwed onto a full bottle. As pills are used the insert expands to fill the void and hold the pills in place.

Aside from convenience, the expandable closure is said to be more hygienic than cotton plugs since it is never touched in use. The inserts, used for some time by leading German pharmaceutical firms, are now being introduced in this country.

New polyethylene tablet bottle closure employs flexible insert, left, which snaps into screw cap. Insert expands to hold tablets in place even when bottle is half empty.

Two New Decorative Coatings for polyethylene have been announced recently. One is a new process for vacuum-metallizing polyethylene. Brilliant coatings result, with excellent adhesion even on such items as squeeze bottles. Alcohol-proof top coats can also be applied by the same method.

What is reported to be the first adhesive for flocking polyethylene has been announced by another manufacturer. The new adhesive makes it possible to apply a velour coating to sheet or molded products. The process is expected to find application in packaging cosmetics and quality items such as silverware.

U.S.I. Announces Ultra-Clear Poly Film Produced by Cast-Film Process

Cast Film Has Unprecedented Transparency and Gloss

An ultra-clear polyethylene film, made by a conventional processing technique adapted to polyethylene film production, was introduced by U.S.I. at the recent National Packaging Exposition in New York. The film, made from a U.S.I. PETROTHENE resin, has a level of transparency and gloss unprecedented in polyethylene film.

The production method, called casting, employs equipment typical of the extrusion coating industry. In the process polyethylene is extruded and drawn or cast across a highly polished chrome-plated roll. This casting step greatly improves the optical characteristics of the film. This production method also reduces formation of haze-producing crystals in the matrix of the polyethylene by providing for immediate and even quenching. This further contributes to improved clarity.

Extensive research at U.S.I.'s technical service laboratory indicated that a moderately high density resin would be required to strike a balance between properties which promote clarity and those promoting strength. PETROTHENE 205—with a density of 0.924, melt index of 3.0, and excellent draw-down properties—was selected.

MIRROR IMAGE? No, but the excellent clarity and gloss of cast POLYETHYLENE film make it almost believable.

Production Costs About Equal

Although the equipment needed for making cast film is initially more expensive, production costs appear to be competitive with those for conventional extruded film. Production speed for cast film is the same or greater than for other film producing processes.

Production on laboratory-scale equipment indicates that careful control of die temperature and size of die opening is necessary to assure gauge uniformity. However, with proper operating conditions and careful choice of resin, the resulting film has adequate toughness along with its phenomenal clarity. Widespread application in the packaging industry — where clarity is often a prime consideration — is expected.

Nitrogen Blanketing Aids Polyethylene Processing

Nitrogen blanketing of polyethylene extruder helps overcome gels, fish-eyes, dark spots and other problems caused by polyethylene oxidation.

The procedure was developed at U.S.I.'s technical service laboratory at Tuscola, Ill. According to Ralph Knight, Manager of U.S.I.'s PETROTHENE Technical Service Department, inert gas also can be used to blanket the molten polyethylene as it leaves the extruder in order to reduce build-up of oxidized material on the die lips of the extruder. The same principle is applicable to other polyethylene processing methods.

Coffee Plants Grown in Black Poly Bags

A promising new use for black polyethylene film is reported from Central America. Black poly bags filled with fertilized soil are being used to grow coffee plants in Guatemala. The polyethylene film acts as a combination flower pot and mulch.

According to the report, when coffee plants are grown in black polyethylene film bags, they can be brought to transplanting size in nine months instead of the eighteen months required by previous conventional methods. In the past year, approximately seven million polyethylene bags were used in Guatemala.

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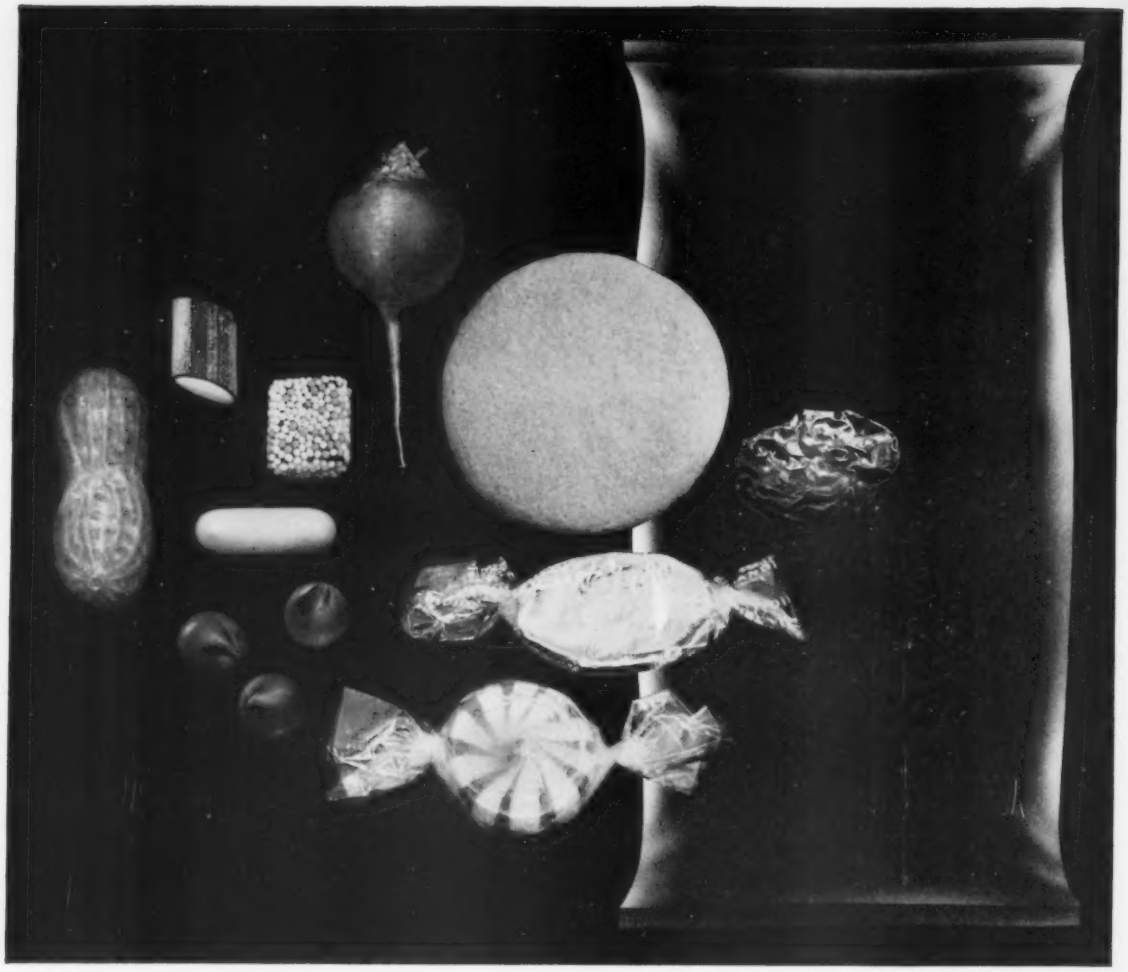

Cantilever Scales On PACKAGE Transwrap

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Now, to improve completely automatic packaging operations on the Package Transwrap, an entirely new scale gives you the most accurate, trouble-free weighing available anywhere. This Model PS Scale has been designed with cantilever action. There are no balances or knife edges to get out of adjustment. Electronic sensing and elimination of bouncing with the cantilever design make the Model PS more accurate than other types of scales.

In addition, the Model B Transwrap will now handle polyethylene film, gives you bag widths up to six inches. An improved, simplified impulse sealing mechanism with cold-wire cut-off insures tight seams. Its new design provides material savings by making a ⅛" wide seal at both ends of the bag and a clean cut-off.

You can get details on the new Model PS Scale, and the improved Model B Transwrap, by contacting your Package representative. He can show you how Transwrap's completely automatic operation will improve your packaging and cut your costs.

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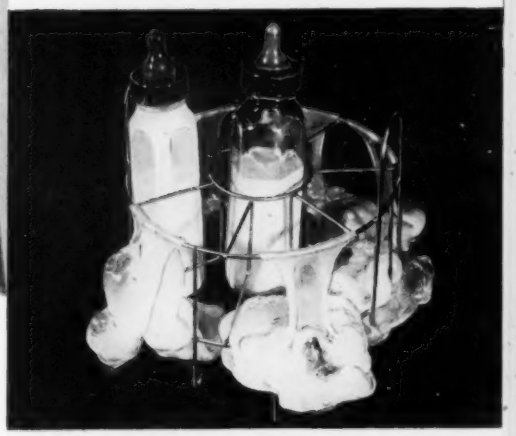

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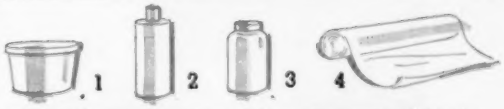

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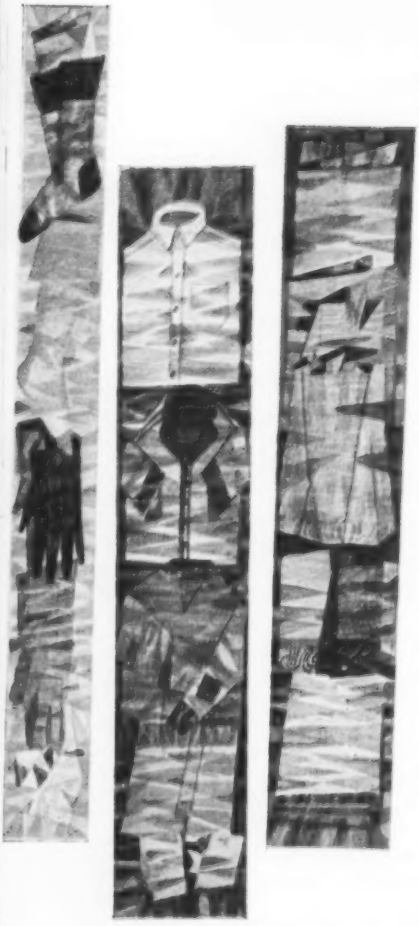

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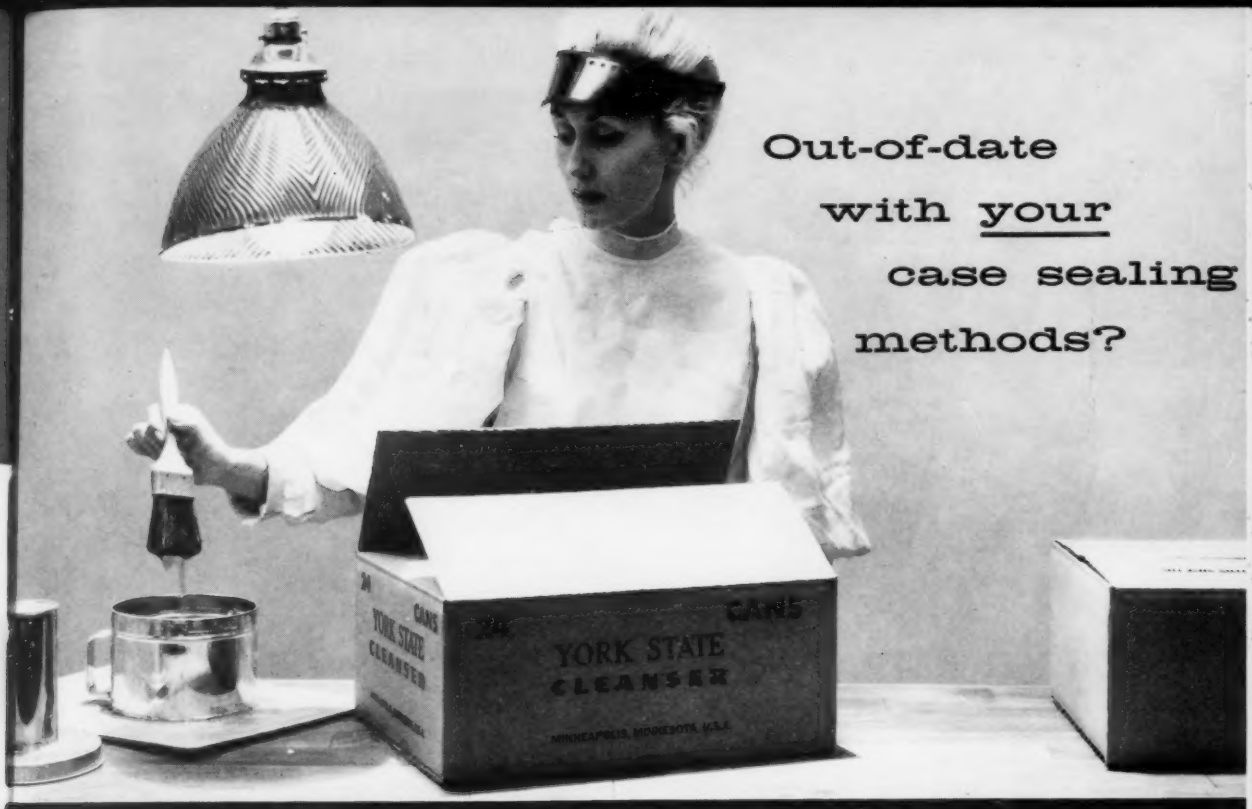

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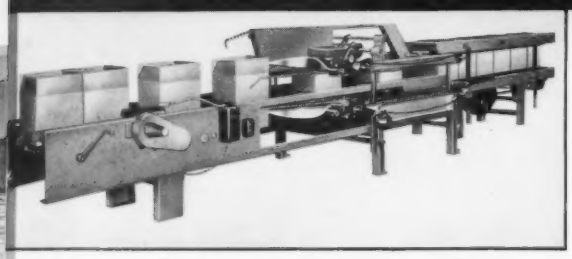

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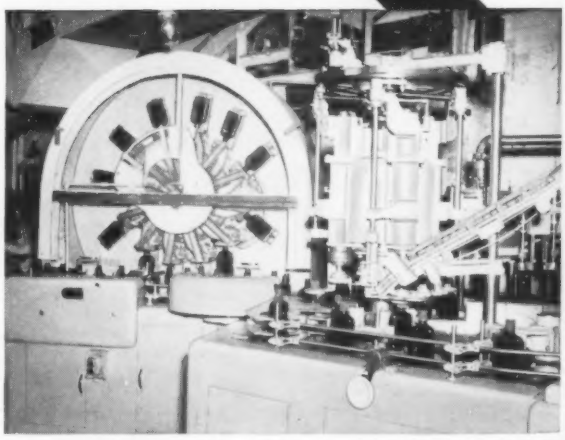

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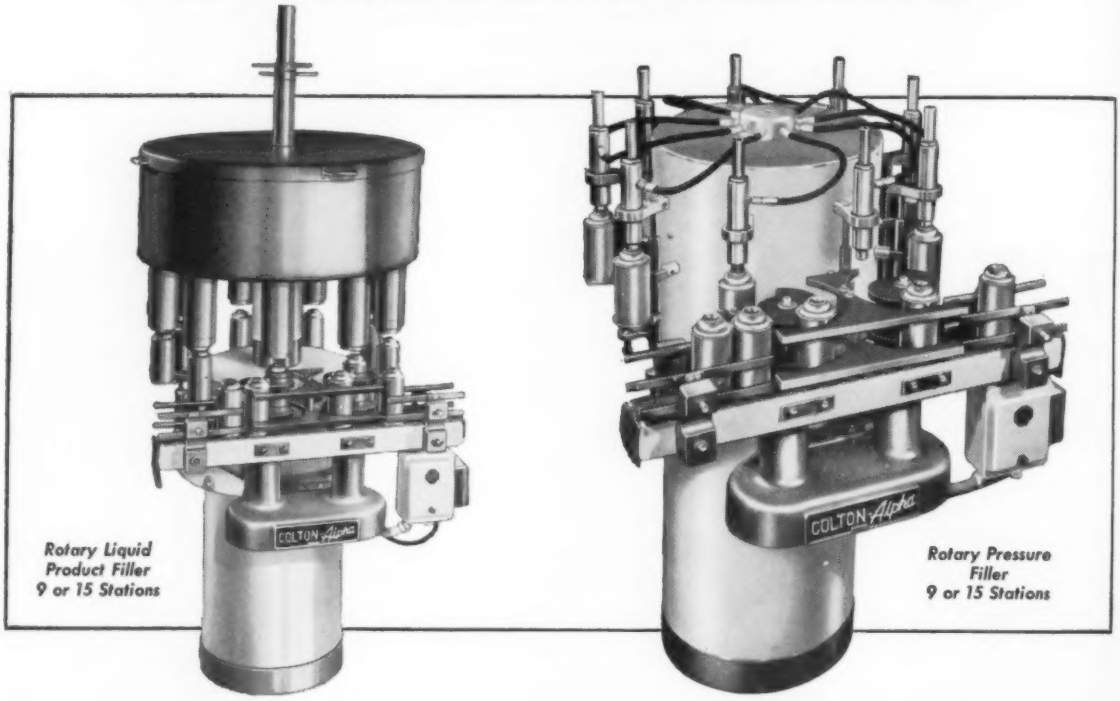

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Mark K. Dresden is an alumnus of Swarthmore College. Since 1934 he has been associated with A. H. Wirz, Inc. His experience includes considerable accounting and financial activity, as well as management and sales. Prior to joining Wirz, he was with Scott Paper Company. His association activities include Packaging Institute and Collapsible Tube Manufacturers Association.

Printing of collapsible tubes

By Mark K. Dresden,
President,
A. H. Wirz, Inc.,
Chester, Pennsylvania

Technical and operational packaging specialists frequently must take a hand in specifying such details as the printing of collapsible tubes. The intricacies and subtleties of such specifying drive home the importance of a package user being able to relate a supplier's manufacturing art to the development of user performance requirements. Mr. Dresden cites six rules contributing to optimum performance of tube printing. His enumeration of these and explanations offered in support of them merit the attention of anyone concerned with collapsible tubes.

The lithography of collapsible metal tubes goes back to the early part of the century and probably contributed more to the success of this form of package than any other single development. Great advances in lithography have been made since that time and today's lithographed metal tube is a thing of real beauty and utility.

While tube lithography is essentially the same as most other kinds of printing, there are a few peculiar problems which, if better understood, would help the tube user to get the best results on his package. Those responsible for package specifications and for the technical application of color should be alert to the technology of tube printing. Packaging experts thoroughly familiar with the printing of other packaging materials often overlook the specialized factors in tube printing.

The process consists of two basic operations, the base coat, which is applied by a roller to whatever portion of the tube wall is desired, and the printing, which is done by the rotary offset process. Occasionally a clear lacquer top coat is applied, but with today's good inks and coatings, the need for lacquer has largely disappeared.

Choosing Base Coat

Since the base coat is a relatively heavy, opaque film and the printing is a relatively thin and more delicate film, it is usually essential that the lightest color in the design be applied by the base coat with the other colors applied by printing. For reasons which will be discussed later, it is also desirable to avoid a broad expanse of any printed color. Thus, in evaluating printing design technique, we come to the first essential for creating technically good printed tubes.

Rule 1: The base coat should be the lightest color and the predominant color on the tube. In the vast majority of cases, it develops that the base color is white and it is a very effective color. (See Fig. 1)

The application of the base coating is relatively simple. It is applied by a roller, that is, a pick-up roll revolving in a reservoir of coating; another roll smooths out the coating, and a third roll transfers the coating to the tube wall as it is revolving against the coater roll. Depending upon the diameter of the tube, the speed of the rolls, and their diameter, the tube is revolving one or more times against the coating roll. The film thickness of the base coating is relatively heavy, usually running from 0.0005 in. to 0.001 in. (See Fig. 2)

Flow, Hiding Important

For the coating to function properly in the machine, it should have good flow-out and hiding characteristics. Occasionally difficulty is encountered with "curtains" and overlap. These "curtains" are extremely heavy layers of coating. The coating is so heavy that it does not flow out smoothly, but leaves distinct lines of demarcation where one layer has more or less rolled over another layer. This obviously detracts very much from the appearance of the tube.

Problems of overlap. It is im-

Fig. 1. Base coat should be lightest color and predominant color on tube. Note that this base coat (A) covers practically all of tube. Base coating thickness is relatively heavy, such as from 0.0005 in. to 0.001 in.

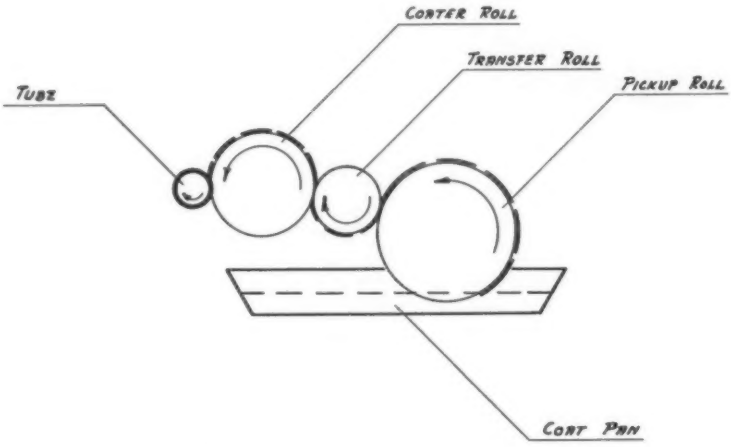


Fig. 2. To apply base coating, pick-up roll transfers it from coat pan to transfer roll, which smooths it out and transfers it to coater roll, which applies it to tube wall itself.

portant that the film be sufficiently thick so as to give good hiding, but when it is too heavy, overlap and other troubles are occasioned. Some colors present more problems than others. A "pure" white, if there is such a thing, is especially troublesome probably because the contrast of shadows is greatest against a "pure" white. The purer the white, the more obvious the overlap and curtains on the tube coating. It is desirable to tint a white coating slightly to get better hiding.

While white is the usual basecoat color, there is no reason why other colors cannot be used so long as it is remembered that the base color should normally be the lightest in the design. To every rule there is always an exception and it should be pointed out that it has been possible to work out special inks and printing techniques which permit the printing of a color lighter than that of the base coat. A tube user with such a problem should consult carefully with his tube supplier to make certain that his particular job can be well done.

A Metallic Appearance

One interesting and very effective development in base coatings has been the use of a metallic-like finish. Here the film thickness is considerably reduced and the coating is somewhat transparent so that the metal luster of the tube wall will show through giving the metallic effect. With this type of design, it is highly important that the tube is bright and clean, and free of excessive lubricant or scratches. This is another somewhat specialized type of design and thorough consultation with the tube supplier is essential.

Choice of coatings. The chemistry of tube coatings is a big field in itself. Suffice to say that the best results are obtained today with coatings based on vinyl resins. They seem to measure up best to the stringent requirements of a good coating material.

The most important single characteristic of the tube coating from a user's point of view is flexibility, that is, the ability of the coating to withstand the crimping operation when the tube is filled, as well as the many wrinkles and distortions which inevitably occur when the tube is being used. Elaborate techniques have been developed by tube manufacturers to control the flexibility of the base coating.

Flexibility Problems

Tubes, unlike many other containers, as well as most any surface which is painted, go through many flexings, so that what might be a very excellent coating for a refrigerator would be of no value on a collapsible tube unless it were flexible. For that reason a great deal of attention is paid to the characteristics of flexibility. In addition, good chemical resistance to the product with which the tube is likely to come in contact is important.

Here it would be very desirable for the tube user to specify what he expects the finish to withstand. With a product such as shaving cream, toothpaste, and pharmaceuticals, good soap and alkali resistance is desired; with products such as grease and lubricants, resistance to the product itself. Lightfastness may be important.

In the pharmaceutical industry, tubes are often sterilized, so that the ability to withstand sterilization temperature could be an important characteristic.

Establish requirements clearly. For example, a tube that contains an impression material used by the dental profession must go into the dentist's sterilizer in order to soften the impression material. Therefore it is necessary that a system of coating and inks be used that will stand boiling water for approx-

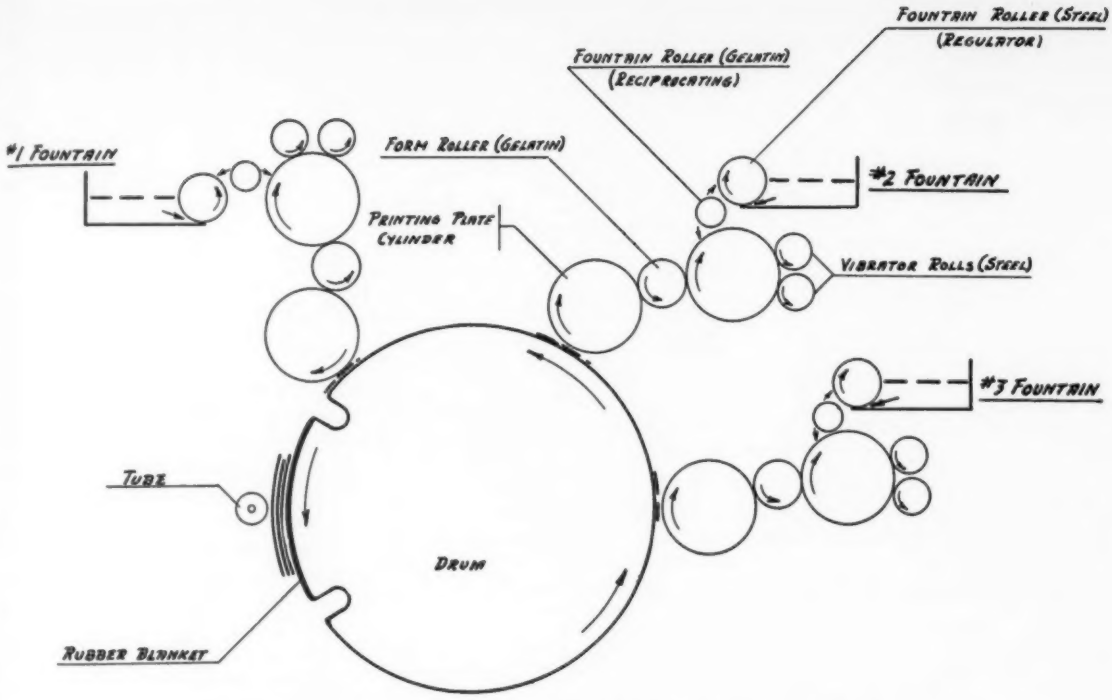


Fig. 3. This printer has a separate ink fountain and cylinder for each printed color. With each revolution, ink is dispersed on its individual plate and transferred to rubber blanket and by this to its correct location on tube itself. This rotary offset process permits lithographing tube's cylindrical surface, applies all colors at one time.

imately one-half hour without affecting them. Because full information was provided by the user, it was possible to develop proper materials to withstand the sterilization. Similar treatment might be wholly unnecessary with other products such as toothpaste. The important thing is that the user must clearly establish his performance requirements and must articulately report them to his supplier.

It is hoped that this suggests the type of specification and information which the tube user should furnish the tube manufacturer. In summary, we have **Rule 2: Be certain to specify conditions which the tubes should withstand.**

Printing Technique

With the printing colors, a little different set of problems arise. It is possible to print up to four colors and the important point to remember is that all the printed colors are applied to the tube *wet*, at one time. The process used for printing tubes, namely, rotary offset, is the only practical means of lithographing a cylindrical surface. Obviously tubes could not be printed flat, as is the case with paper, sheet metal, etc.

Fig. 4. Even with lettering here, this tube avoids excessive areas of printed colors (A) and avoids close registration of colors. Letters are large and bold. Use of window or panel (B) permits using base color as background, or permits having clear area (such as white) in which to place small or close lettering.

Transfer of ink. The printing machine is built so that it has a separate ink fountain and cylinder for holding a printing plate for each printed color. A separate plate must be made for each printed color. In operation the machine is so designed that with each revolution, ink from the fountain is dispersed on its individual plate and then this plate transfers its design to a certain very accurate location on the rubber blanket. (See Fig. 3)

At the same time, the same thing occurs with a succeeding printing color and the machine is so arranged that all of the various colors being printed are registered together on the rubber blanket

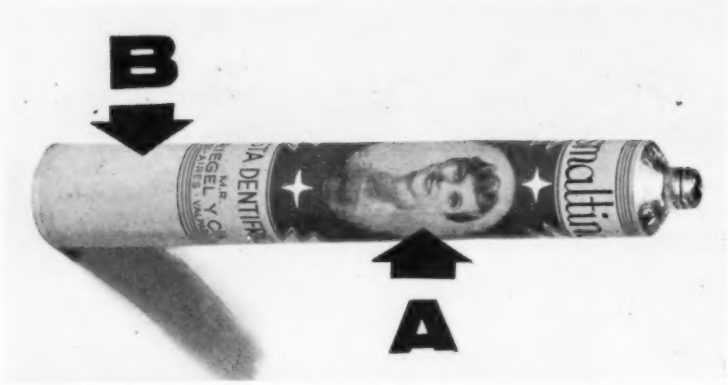


Fig. 5. By means of screens and accurately produced printing plates, it is possible to reproduce elaborate designs, including human portrait (A). Even with such printing, base coat (B) is dominant on tube and furnishes setting for rest of printing.

and then the entire design is transferred or offset to the tube surface.

How Large Areas To Print?

It has previously been mentioned that it is desirable to eliminate a broad expanse of a printed color. This is because the ink film which is printed on the tube is very thin and it is difficult to get good uniformity over a large area. Where large areas of printed surface are required, there is likely to be a variation in color over the area caused by slight variation in thickness of the ink film. The lighter pastel shades are the most difficult to contend with in this respect, whereas with a dark, strong printed color, better results are obtained.

Causing variations. Very slight, almost microscopic, variations in the pressure exerted by the printing plate on the rubber blanket and in turn the rubber blanket on the tube, can cause substantial variations in the thickness of the ink film and thereby the color itself on the tube. For this reason, our next rule is important. Hence, **Rule 3: Avoid excessive areas of printed colors.** (See Fig. 4)

Registration Critical

As described previously, all of the colors are actually registered in their proper position on the rubber blanket and offset to the tube surface. It is, therefore, desirable to avoid as much as possible the close registration of one color with another. Where the wet inks are close together on the printing blanket, they are likely to intermingle, resulting not only in fuzzy, indistinct printing, but making color control difficult. In working out a design to be printed on a collapsible tube, therefore, close registration of various printed colors should be avoided just as much as possible. Hence, **Rule 4: Avoid excessive close registration of the colors in the design.**

One way in which close registration can be avoided is by the use of reverse printing, utilizing the base coat color for the type matter. This technique is accomplished by making the plate in such a way that the letters desired to be printed, or whatever other portion of the design is involved, are surrounded by a printed color and the letters, etc., show up in the base coat color.

It is desirable with reverse printing to keep these letters as large as possible so as to avoid the possibility of the plate filling in with ink, which would result in blurred and indistinct printing. This leads us to **Rule 5: Endeavor to keep the letters and intricate design as large and as bold as possible.**

Lettering On Base Coat

Another way of accomplishing this result and also to aid in breaking up a large expanse of a printed color is to use a "window" cut into the design so that the wording could be printed positively on the base coat, well separated from the balance of the design.

Some very striking and elaborate designs, including a good human portrait, can rather easily be printed on a tube through the use of screens. This is the process of plate-making where various shades and gradations of color can be obtained by using little dots varying in size, the concentration of the dots providing a variation in the color effect. The plates for this type of printing are very elaborate and are considerably more expensive than a normal plate. Very striking results can be obtained, however, but the plates must be carefully and accurately made. (See Fig. 5)

Requirements for ink. The important physical characteristics of a printing ink are good hiding, good scuff resistance, good color uniformity, good rub resistance, good gloss, good light stability, and as with the base coating, good resistance to products with which the ink is likely to come in contact. Because of the very thin printing ink film, flexibility is not normally a problem with printing ink. As with base coating, Rule 2 should be followed by the tube user so that the tube manufacturer will use inks with the proper resistance characteristics. Here again the tube manufacturers have developed many techniques to evaluate and control these features.

Control Of Color

One of the most vexing problems to both user and manufacturer is that of color control. There are, of course, scientific methods of measuring color, but in the last analysis, the good eye and good judgment of the set-up mechanic and the quality control man are essential to the faithful reproduction of a desired color.

The first thing that is needed is a clear understanding of what col-

(*Continued on Page 62*)

Robert J. McCormick is a graduate of Michigan College of Mining and Technology with a B.S. degree in chemical engineering and engineering. He has been associated with the plastics technical service department of The Dow Chemical Company since his graduation. Currently, he is field development engineer in this department.

A close look at polystyrene film

By R. J. McCormick,

Plastics Technical Service,
The Dow Chemical Company,
Midland, Michigan

This part of the article opens with a continuation of the discussion of orientation started in the preceding part. The text appearing below is a continuation of the text that ended on page 26 of our June issue.

Here is the second part of a two-part article on polystyrene film. This part reviews the methods of orienting such film, has a discussion of the physical properties of oriented film, a review of fabrication and conversion of the material, and a discussion of its specific applications. The first part of this article, which appeared in our June issue, reviewed the problems of plasticizing the film, looked at its orientation, and examined such of its aspects as stretching.

Orientation affects properties of polystyrene other than the heat distortion temperature, tensile strength, elongation, and toughness, but the scope of this article prohibits further discussion of other effects. It should be noted, however, that the modulus of stiffness of the material is increased by orientation.

Resistance to crazing and degradation from outdoor exposure is improved somewhat, but not nearly as much as desired. Electrical properties and the rates of transmission of water vapor and gases are virtually unaffected by orientation. The density (8) of polystyrene is increased slightly by orientation because the molecules become more closely packed. However, orientation accompanied by an increase in density must not be considered as crystallinity, for even highly-stretched polystyrene shows no evidence as being crystalline (9).

METHODS OF ORIENTING PLASTIC FILM:

Now that orientation and its effects on polystyrene have been reviewed, let us consider the ways in which the film can be oriented. Orientation can result from any process which causes shear gradients (8) to be developed within the material: Milling, spinning from solution, injection molding, and extrusion. For this discussion, only extrusion followed by stretching will be considered, as it is the only one easily adapted to film production. There are four known methods for accomplishing this.

Probably the first method to be developed for the production of a bilaterally oriented polystyrene film originated in Germany sometime prior to 1932 (10) (11) (12) (13) (14). This method, Fig. 10, involved the extrusion of a tube from a ring die and subsequently pulling the tube over a parabolic spreader mandrel. The film take-away rolls are operated at sufficient peripheral speed to give the desired stretch in the machine direction.

As the tube is drawn over the mandrel, it is stretched in the transverse direction. The mandrel is equipped with a number of rollers along its periphery to prevent the film from sticking to it. In actual production, the edge trim is slit off as scrap, and the resulting two webs of film are wound on separate rolls.

The Bubble Process

A second method of orienting film was also devised several years ago (15) (16) (17) (18) (19) and is shown in Fig. 11. It is commonly called a bubble process and, in many respects, is similar to the

FIG. X
SIMPLIFIED SKETCH OF A DEVICE FOR ORIENTING PLASTIC FILM

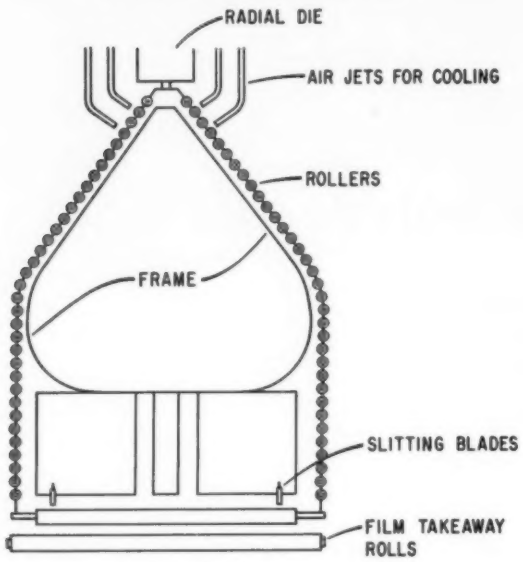
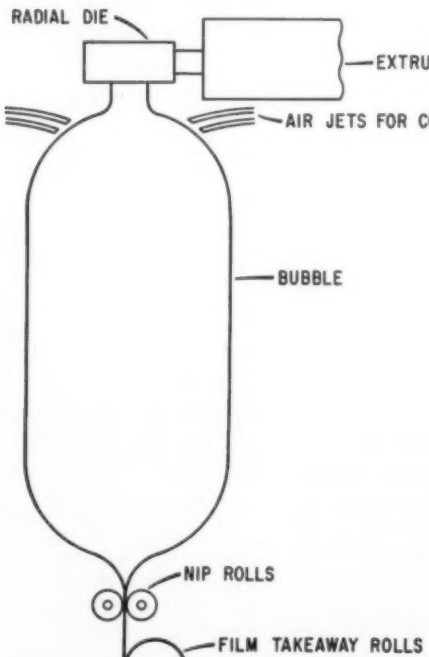


FIG. XI
A SIMPLIFIED SKETCH OF A DEVICE FOR ORIENTING PLASTIC FILM – COMMONLY CALLED "BUBBLE PROCESS"



first one described. It differs essentially in that the mandrel is replaced by a volume of compressed gas, usually air, locked within the tube.

The gas is entrapped between the nip of a set of squeeze rolls and the die from which the molten plastic is extruded. As a result, the gas remains in a constant position, and the extruded tube is actually forced over it. Supplemental forms or spreading devices are sometimes used to aid in cooling and shaping the tube.

The squeeze rolls are used to draw the tube at the rate of speed necessary to impart the desired orientation in the machine direction. Orientation in the transverse direction is controlled by the quantity of gas confined within the tube.

This process is a difficult one to control when used with amorphous materials, since no convenient endpoint of stretching is present as it is with crystalline materials. Modifications of this technique are used in producing Saran Wrap* and polyethylene films.

Third Method: New Concept

An entirely new concept is involved with the third method of producing an oriented thermoplastic film (20) (21). In contrast to the other methods discussed, this one is a comparatively new one.

The polymer is fed from an extruder, Fig. 12, through a radial die as a unitary sheet which is radially fed outward to sets of slitters and take-away rolls disposed equidistant from the centrally located die. The take-away rolls are so situated as to form a closed polygon. They are internally cooled and perform the dual operation of drawing the sheet from the die and cooling it after orientation has been accomplished.

All of the take-away rolls are operated at a synchronized peripheral speed, thereby effecting continuous and uniform stretching of the sheet. The speed of these rolls determines the amount of

*T. M.–The Dow Chemical Company

longitudinal orientation; the width of the take-away rolls, a function of the distance they are located away from the die, controls the transverse orientation.

Fourth Method Comparable To Textile Tentering

The fourth method of orienting a plastic film is one which, in many respects, can be compared to the tentering process used by the textile industry to stretch a fabric into its proper dimensions (22)(23). The orientation process is far more complex, however, because of the necessity for very accurate temperature control. See Fig. 13.

The apparatus consists of several major components: An extruder, a flat sheet die, a series of internally cooled rolls, a stretching device, an oven which contains a number of carefully controlled temperature zones and which also encloses the cooling rolls and the stretching device, and suitable winding equipment.

The extruder homogenizes the polymer and raises it to the temperature required to obtain the proper viscosity for extrusion through the die as a flat sheet. The series of cooling rolls conveys the sheet from the die at a rate which prevents stretching it. They also cool the sheet to a predetermined temperature.

The temperature of the surface of the sheet is probably lowered below that desired for orientation, while the interior of the sheet still remains above that temperature. The cooled sheet moves forward through the oven after leaving the rolls and is reheated to the proper temperature for orientation. The cooling and subsequent reheating of the sheet aid in bringing it to a uniform temperature throughout its cross section. The sheet is now ready for orientation by the stretching device.

Stretching is accomplished by a number of grippers mounted on conveyors situated on each side of the sheet. The grippers engage the sheet and move forward several times faster than the speed at which the sheet is delivered from the

FIG. XII

SIMPLIFIED SKETCH OF A DEVICE FOR ORIENTING PLASTIC FILM

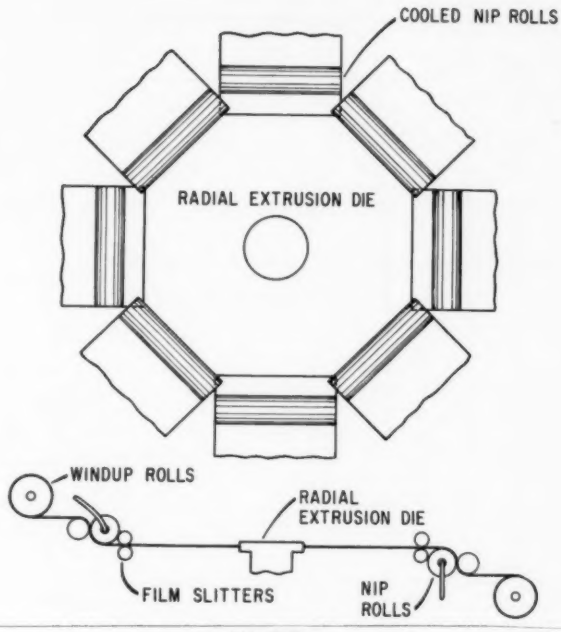


FIG. XIII

A SIMPLIFIED SKETCH OF A DEVICE FOR ORIENTING PLASTIC FILM

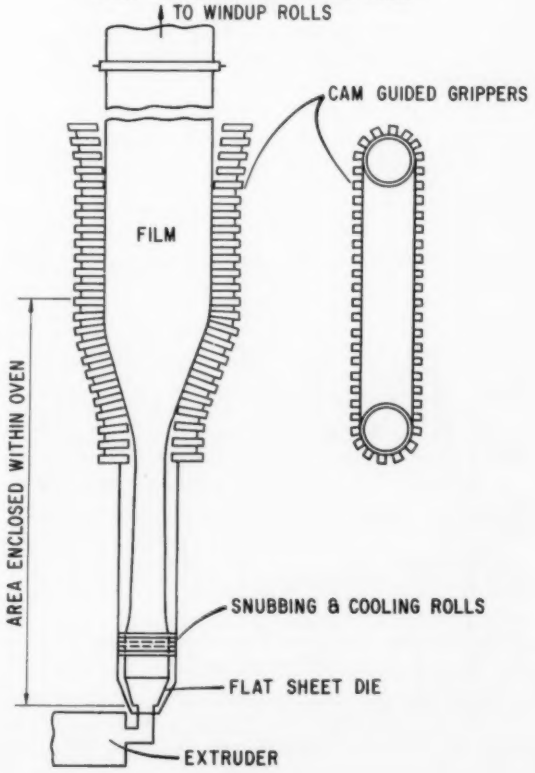


FIG. XIV

PERCENT TRANSMISSION OF LIGHT THROUGH POLYSTYRENE FILM VS WAVE LENGTH

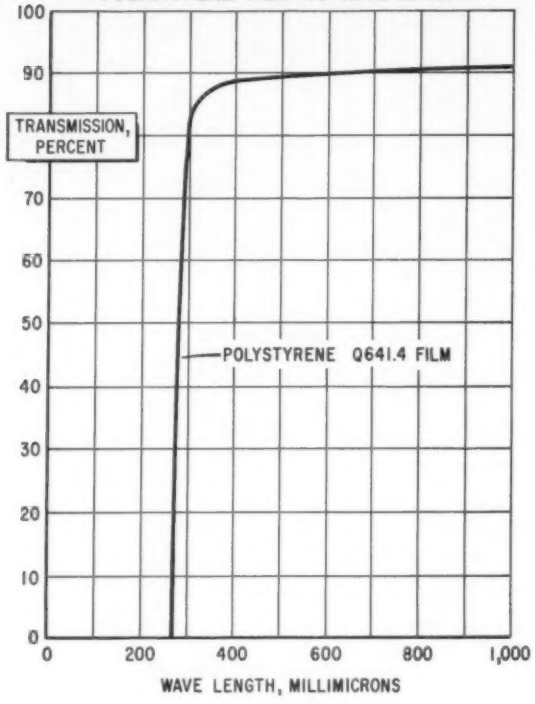
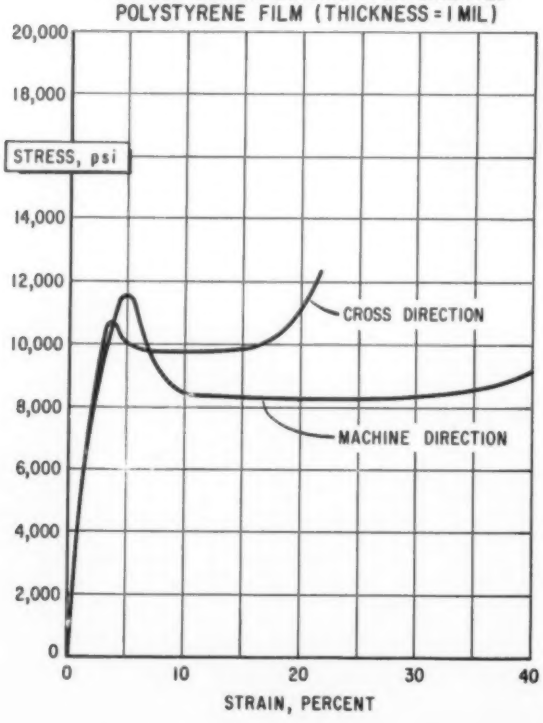


FIG. XV

STRESS-STRAIN DIAGRAM FOR ORIENTED POLYSTYRENE FILM (THICKNESS = 1 MIL)



cooling rolls. Thus, longitudinal orientation of the sheet is attained. While some of the grippers are drawing the sheet forward, others situated farther forward in the device are moving transversely outward under the action of cams, thereby orienting the sheet in the cross direction.

The sheet leaves the oven after orientation and is cooled in the atmosphere. The grippers are released from the sheet, the edge trim is slit away, and the finished sheet is finally wound into rolls.

Need Accurate Control Of Sheet Temperature

It should be emphasized when discussing methods of orienting polystyrene film that very accurate control of the temperature of the sheet is essential. The amount of orientation obtained from stretching is inversely proportional to the temperature at which the sheet is stretched, providing the temperature is above the second order transition point.

Stretching the plastic at high temperature has little effect upon orientation. Stretching at temperatures just above the transition point is the most effective, but because of the difficulties encountered when working with the material at these low temperatures, an intermediate temperature range is usually used in actual production. Obviously, any variations in the temperature of the plastic will affect the properties of the end-product.

It is also important that the thickness of the extruded sheet be maintained accurately. Thick and thin sections cool and stretch at unequal rates, thereby producing areas of unequal strength and gauge in the finished film. Uneven temperatures throughout the sheet at the time of orientation will also adversely affect the product in a similar manner.

Fortunately, both domestic producers of oriented polystyrene film, Plax Corporation and The Dow Chemical Company, are consistently able to control their production processes to the degree required

to produce film of acceptable quality.

PHYSICAL PROPERTIES OF ORIENTED POLYSTYRENE FILM

Oriented polystyrene film is being produced in a number of gauges ranging from 1 mil up to, perhaps, 15 mils. The discussion of physical properties and applications in this article will generally be restricted to those applicable to thicknesses of 2 mils or less. However, many of these properties will be identical or vary only slightly with an increase in thickness. The properties will also be practically identical for film produced either by Plax Corporation or The Dow Chemical Company, except for relatively minor variations in mechanical strength.

No film is completely satisfactory for all possible applications and polystyrene film is no exception. Therefore, the discussion of its properties will be kept as objective as possible—that is, not only the desirable properties of the film will be outlined, but also, the limitations of the material. Methods by which undesirable properties or limitations can be eliminated or improved will also be presented whenever applicable.

Polystyrene film possesses excellent clarity and a great deal of sparkle and gloss. These properties are, of course, desired in any film used in the majority of packaging applications. The sparkle and gloss of polystyrene film result partly from the high refractive index of the polymer, 1.60, n_D^{25}, and also because of a minimum of diffused reflection from its extremely smooth surface.

Examination of a plot of per cent light transmission through the film versus wave length, Fig. 14, will show that 90 per cent or more of the light in the visible and infrared regions is transmitted. No light in near ultraviolet region below about 300 millimicrons is transmitted.

Probably the two most important physical characteristics of polystyrene film are its outstanding dimensional stability and excellent aging characteristics. Polystyrene will not absorb more than a negligible amount of moisture; therefore, it is virtually unaffected by changes in humidity. The film can not expand and wrinkle at high humidity, and it can not shrink at low humidity.

The aging qualities of oriented polystyrene film can be attributed to its inability to absorb moisture and to the absence of plasticizers. The film cannot dry out and become brittle at low humidity or when used to package hygroscopic products. The film is almost completely unaffected by changes in humidity conditions.

Polystyrene film can not be recommended for applications which may involve outdoor exposure, for it, like most other films, degrades rapidly when exposed to the elements. On the other hand, exposure to indoor lighting does not adversely affect the film even during extended exposure. To our knowledge, no failure of the film because

GAS TRANSMISSION RATES THROUGH VARIOUS FILMS

Gas	Polystyrene Film	Polyethylene Film	Cellulose Acetate Film	Moisture-Proof Cellophane
O_2	210	340	110	0.18
N_2	40	110	25	0.02
CO_2	930	880	560	9.90
Air	60	150	40	0.06

Fig. 16. A comparison of rates of transmission of dry gases through polystyrene film, polyethylene film, cellulose acetate film, and moistureproof cellophane. (Rates are: cc/100 sq. in/24 hr/mil at 77°F. and 1 atm. pressure differential, as determined by A.S.T.M. Method D-1434-56T).

PROPERTIES OF ORIENTED POLYSTYRENE FILM

Property	Units	Approx. Value
GENERAL:		
Area Factor	sq.in/lb/mil.	25,400
Water Absorption	% at 75°F. (equilibrium)	0.7
Indoor Aging		Excellent
Resistance to Sunlight:		
Indoor		Excellent
Outdoor (Short Time Exposure)		Satisfactory
Specific Gravity	gm/cc.	1.05
Moisture Vapor Transmission	gm/100 sq.in/24 hr/mil. (100°F., 90% R.H.)	6
MECHANICAL:		
Tensile Strength	lb/sq.in.	L.W. 9,000-10,000 C.W. 9,000-10,000
Burst Strength (1 mil thickness)	lb/sq.in.	35-45
Modulus of Elasticity	lb/sq.in.	4.5×10^5
THERMAL:		
Softening Point	°F.	200
Shrink Point (1% shrink)	°F.	185
Thermal Coefficient of Expansion	in/in/°C.	$6\text{-}8 \times 10^{-5}$
ELECTRICAL:		
Dielectric Strength (60 cycles)	volts/mil.	5,000
Dielectric Constant:		
60 cycles		2.50-2.55
1,000 cycles		2.50-2.55
1,000,000 cycles		2.50-2.55
Power Factor:		
60 cycles		0.0002-0.0004
1,000 cycles		0.0002-0.0004
1,000,000 cycles		0.0002-0.0004
Volume Resistivity	ohms	10^{21}
OPTICAL:		
Transmission (visible range)	%	90
Refractive Index (n_D^{25})		1.60

Fig. 17. Properties of oriented polystyrene film. The properties shown are those frequently determined for most films.

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"Carolina Belle" is part of Riegel's integrated operation, connected directly to its pulp mill that turns out the world famous Albacel and Astracel pulps. These 88-90 brightness pulps, combined with the newest and most modern paper machine of its type, assure you of high-quality, low cost sulphate papers for all requirements—printing by letterpress or offset . . . folding, scoring and die-cutting . . . coating with lacquer, varnish, wax or polyethylene.

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FIG. XVIII

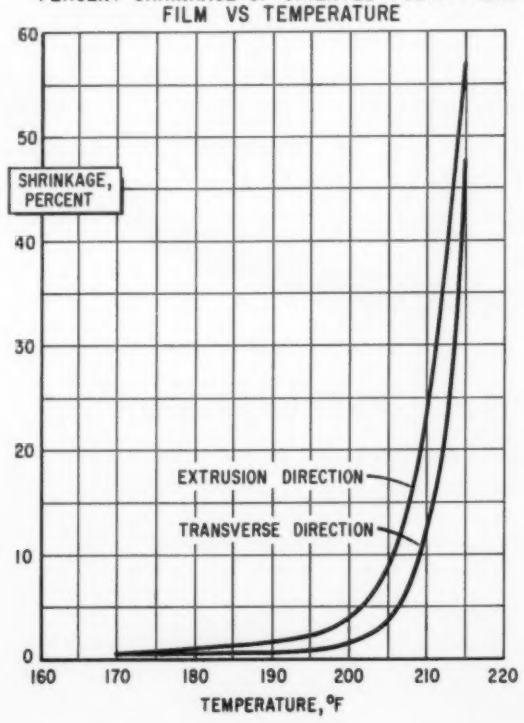
CHEMICAL RESISTANCE OF ORIENTED POLYSTYRENE FILM (A.S.T.M. TEST METHOD D-543-43)

REAGENT	RESISTANCE
WEAK ACIDS	EXCELLENT
STRONG ACIDS	POOR
WEAK ALKALIES	EXCELLENT
STRONG ALKALIES	GOOD
GREASES AND OILS	GOOD *
VEGETABLE OILS	GOOD *
MINERAL OILS	EXCELLENT *
ORGANIC SOLVENTS	POOR
ALCOHOLS	GOOD *

* GENERALLY SO --
THERE ARE SOME EXCEPTIONS

FIG. XIX

PERCENT SHRINKAGE OF ORIENTED POLYSTYRENE FILM VS TEMPERATURE



of a lack of indoor aging qualities has ever occurred, even during extensive field evaluations.

The mechanical strength of oriented polystyrene film appears to be entirely adequate for use in most packaging applications. The stress-strain curve for the film, Fig. 15, illustrates that the tensile strength of the film is nearly equal in both the machine and the transverse direction. The tensile strength usually ranges from 9,000 to 10,000 p.s.i., although many test specimens are considerably stronger.

The elongation of oriented polystyrene film is very difficult to measure, and erratic results are often obtained. A test specimen may be initially strained only in a localized area. If the specimen breaks before the strain area is enlarged with further application of strain, a low elongation reading results. However, in many instances, the strain area will propagate throughout the complete gauge length, thus yielding a high elongation value. The values obtained may range from 6 per cent to as high as 40 per cent or more. It is thought that edge effects may be responsible for this behavior, but other unknown factors may also be involved.

The burst strength of oriented polystyrene film is relatively high, 35 to 45 p.s.i., for one mil film. The burst elongation, as calculated from the height of the bubble at failure, is 30 to 35 per cent. These elongation measurements are consistent as compared to the results obtained by measuring the strain on tensile testing equipment. This indicates the failure to obtain reproducible elongation measurements with standard methods is not because of variations between samples.

Oriented polystyrene film is stiffer than most other films, as is indicated by its high modulus of elasticity, 4.5×10^5. This property can be either an asset or a liability, depending upon the application.

The mechanical properties of oriented polystyrene film, which can

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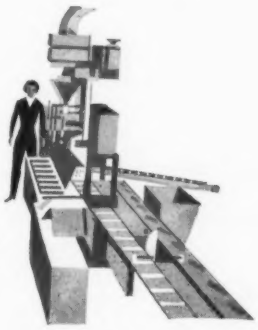
8. High density
9. An excellent coating base and printing surface
10. High ratio of mullen to basis weight
11. Compatibility with other packaging materials
12. Approved wet-strength properties



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Carton inner wraps
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Corrugation

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COMPARATIVE COSTS OF FILMS

Film	Thickness (in.)	Area Factor (sq.in/lb)	Price ($/lb.)	Price ($/M.sq.in.)
POLYSTYRENE FILM*	0.001	25,400	0.60†	0.0236
	0.0015	16,900	0.60	0.0354
	0.002	12,700	0.60	0.0472
CELLOPHANE:‡				
300 Moistureproof	0.0009	21,000	0.62	0.0295
300 Moistureproof and Anchor Coated	0.001	19,500	0.65	0.0333
450 Moistureproof	0.0014	14,000	0.62	0.0443
450 Moistureproof and Anchor Coated	0.0014	14,000	0.65	0.0464
300 Plain	0.0009	21,500	0.65	0.0302
CELLULOSE ACETATE:§				
Extruded - Gauge: 88	0.00088	25,000	0.76	0.0304
100	0.001	22,000	0.76	0.0345
120	0.0012	18,300	0.76	0.0415
150	0.0015	14,600	0.81	0.0554
Cast - - - Gauge: 88	0.00088	25,000	0.93	0.0372
100	0.001	22,000	0.93	0.0422
120	0.0012	18,300	0.93	0.0508
150	0.0015	14,600	0.98	0.0671
POLYETHYLENE‡	0.001	30,000	0.53	0.0177
	0.0015	20,000	0.53	0.0265
	0.002	15,000	0.53	0.0353

*Dow polystyrene film, 2½ in. to 54 in. wide.
†Sold on area basis, price/lb. is approximate.
‡Gauge and yield approximate.
§Slit rolls, least expensive grades.

Fig. 20. A comparison of costs of polystyrene film to other films.

be measured on conventional testing equipment, have now been reviewed. Unfortunately, there are certain physical characteristics for which standard tests for measuring have not been established. The poor resistance of oriented polystyrene film to wrinkling is the most important of these. The film is not seriously affected by flexing if it is kept taut, but severe wrinkling of the film adversely affects its mechanical strength by a significant amount.

Although oriented polystyrene film will not absorb more than an insignificant amount of water, it transmits moisture vapor readily. Its moisture vapor transmission rate is about 6 gm/100 sq. in/mil/24 hr. at 100°F. and 90 per cent R.H. The MVTR, expressed in the same units and under the same conditions, is less than one for moistureproof cellophane (24), about one for polyethylene (24), 45 to 100 for cellulose acetate (24). A range of values is given for cellulose acetate because of variations which exist between different formulations.

The rate of gas transmission of polystyrene film is high (24). Fig. 16 presents a comparison of transmission rates of several dry gases through polystyrene film, moistureproof cellophane, polyethylene, and cellulose acetate. It should be emphasized that the transmission rates given are for dry gases. Because of this, the rates for cellophane should be considered with the fact in mind that the transmission rates of wet gases through the film are relatively high; and in most packaging applications requiring high gas transmission rates, moist conditions are present.

High gas and water vapor transmission rates are of no importance when packaging a variety of products, including paper goods, hosiery, textiles, most toys, and a host of others. High gas transmission rates are required for films used to package fresh red meats, fruits, and vegetables. Fresh red meats must continue to breathe after packaging in order to prevent discoloration. Fruits and vegetables often retain their appearance but develop off flavors and odors when not allowed to respire. Moistureproofness is required in a film for the packaging of many baked goods, meat products, tobacco products, candy, and a host of other foods. Thus, it can be seen, although polystyrene film can be used for packaging a great variety of items, its use should be restricted to those products not requiring moisture protection.

The surface of oriented polystyrene film is hydrophobic—that is, it is not wet by water. Because of this property, moisture condensing upon its surface does so in the form of tiny droplets, thereby causing the film to fog. This particular property is most easily noticed when damp products packaged in the film are transferred from one temperature clime to another. This property is undesirable and, therefore, is being studied by our research people. The tendency of the film to fog is eliminated if the surface of the film is altered so it will cause moisture condensing upon it to form a thin film rather than droplets. Work in our laboratories indicates this can be accomplished economically on a commercial scale.

Examination of electrical properties of polystyrene film, Fig. 17, will show the film is an excellent dielectric. The film retains these properties over a wide range of temperatures and humidity conditions. From examination of the electrical properties, one would correctly theorize the film carries a high static charge on its surface.

The static charge of polystyrene film has not caused any great difficulty in handling it on most window patching or packaging machines. There have been some exceptions, but these have been limited in number. It is felt the stiffness of the film aids materially in overcoming the problems which are usually encountered with a film possessing a static charge. It would, of course, be desirable if the static could be eliminated; therefore, methods of accomplishing this are being studied.

The chemical resistance, Fig. 18, of polystyrene film varies from excellent to poor, depending upon the particular agents considered. Resistance to weak acids, weak alkalis, and mineral oils is generally

excellent. Good resistance to vegetable oils, greases, alcohols, and strong alkalis is usually exhibited. Strong acids and most organic solvents attack the film severely, and most of these will dissolve the film completely.

Polystyrene film is stable toward heat until a temperature of about 185°F. is reached, Fig. 19. At that temperature, the film will shrink about one per cent. Further increases in temperature cause the film to shrink at a rapid rate.

It is conceivable that extremely tight overwraps could be obtained by exposing an overwrapped package to heat. Past experience has shown this technique would necessarily be restricted to cartons or packages which would not distort under the stress produced by the shrinkage of the film.

The heat sealing temperature of polystyrene film has been purposely omitted from Fig. 17 because, as a general rule, heat sealing of the film is not recommended. The temperature differential between the heat sealing temperature and the melting point is very small; hence, the control of heat sealing equipment would be critical. When polystyrene film is heated to the temperature required for sealing, the orientation is destroyed. When the film cools, orientation is not restored; hence, the film in the seal area is extremely brittle. Furthermore, considerable distortion occurs in the seal area unless the film is restrained. Thus, it can be seen there is a definite need for heat seal coatings for polystyrene film if the film is to be used in those applications where good heat sealing characteristics are required. Actually, there is a need for coatings which will not only heat seal, but which will also control moisture vapor and gas transmission to the rates desired for various packaging applications.

Other requirements for a heat seal coating are that it be odorless, tasteless, non-toxic, and clear. It must not block at temperatures encountered in shipping and storage (up to 140°F.). It must heat seal at a temperature below the shrink point of the film. The heat seal range should be relatively wide in order to eliminate the difficulties encountered in maintaining close temperature control on sealing equipment. The coatings should produce strong seals at minimum pressure and time. Finally, the cost of the coating material, combined with the cost of application, must be kept within practical economic limits if the coated film is to be competitively priced.

Obviously, the development of heat seal coatings will not be easily accomplished. However, the many problems involved are being studied in our laboratories. Progress to date has been encouraging, and it is expected that coated polystyrene film will be available in the future.

FABRICATION AND CONVERSION OF POLYSTYRENE FILM:

It has been mentioned previously that heat sealing of polystyrene film is not generally recommended. Recent work has indicated there is a possibility of obtaining a bond of sufficient strength to be satisfactory for many applications by crimping the film under pressure at a temperature of 150°F. Seals of this type are essentially mechanical. Enough work on this type of seal has not been completed to allow definite recommendations to be made.

It is also possible to obtain heat seals using impulse sealing techniques. Seals made in this manner are not exceptionally strong but would probably be adequate for use in many applications. The greatest limitation of this sealing method is that it is not generally adaptable to most overwrapping equipment, bag machines, and other packaging equipment.

No method has been devised for sealing polystyrene film to itself with electronic type seals. There is no known frequency at which the loss factor of the material is sufficiently high to effect a seal.

The use of solvents and adhesives for adhering the film to itself and to dissimilar materials has been found to be commercially practical. There are several suitable solvents available, and a number of adhesive manufacturers have developed products for use with the film. Adhesive and solvent seals are made both with and without the use of heat, depending upon the particular application.

The film can be printed by any of the conventional methods used for printing flexible films, foils, and papers. For long runs, flexography or rotogravure methods are most frequently used. Silk-screening is employed when unusual effects are desired.

The quality of printing which can be accomplished on polystyrene film is excellent. The gloss and clarity of the film enhance the brilliance of reverse printing and give it depth. Ink adhesion is excellent.

Polystyrene film has been metalized with excellent results. The absence of all volatiles in the film reduces the problems involved in maintaining a high vacuum in the metalizing chamber. It has been noted, in addition to the decorative effect produced by metalizing, that a substantial reduction in moisture vapor and gas transmission rates is obtained.

COST OF POLYSTYRENE FILM:

Most users of transparent films for packaging applications are producing products for sale in very competitive markets; therefore, the relative costs of packaging materials are of utmost interest to them. The relative cost of polystyrene film is compared to the cost of cellophane, cellulose acetate, and polyethylene in Fig. 20. The most commonly used cellophanes, the least expensive grades of cellulose acetate, and Dow's polystyrene film are used for comparison.

Most films are sold on a weight basis, but the price per pound in itself is not a true criterion of comparison. The area factor per pound of film of a specific thickness must also be considered.

Polystyrene film, one mil thick,

has an area factor of 25,400 sq. in/lb. and is sold on an area basis at a price of $0.0236/M. sq. in. The price per pound is approximately $0.60. The basing of selling prices on area is a truly fair method of selling films, because the purchaser receives a guaranteed yield of material.

Polystyrene film is produced from a relatively low-cost base material, which is in plentiful supply. This, combined with its high area factor, places the film in an excellent competitive situation. It is considerably less expensive than both cellophane and cellulose acetate, but more expensive than polyethylene film.

APPLICATIONS FOR POLYSTYRENE FILM

The first use of polystyrene films was for electrical insulation in underwater cables.

The use of polystyrene film as windows in envelopes has proved to be an excellent application. Several window envelope manufacturers have been using the film for the past several months with excellent results. The exceptional clarity, dimensional stability, and aging characteristics of the film are all definite advantages in window envelopes because they all add to the appearance and quality of the end product. The stiffness of the film aids in machining, and, according to reports received, oftentimes allows production speeds unattainable with other films. Polystyrene film has what is referred to as "good lay-flat characteristics," and this aids greatly in patching operations. Films which possess this characteristic lay flat after being placed in position on the blank and do not curl or otherwise distort because of absorption of moisture from the adhesive.

The physical characteristics and low cost of polystyrene film allow window envelope producers to make high quality envelopes at less cost than with other transparent films. The acceptance and use of the film in this field are expected to increase rapidly.

Polystyrene film has been accepted by many manufacturers and users of window cartons. The same characteristics of transparency, stability, and low cost desired in window envelopes are also required by many users of window cartons. The use of the film in bacon cartons is a good example of the film's performance. Windows made of the film do not distort or wrinkle when exposed to animal fats in bacon, or because of changes in humidity to which they are subjected. The bacon retains its color and an excellent over-all appearance throughout the expected shelf life of the product. Fogging of the film has not been a problem with bacon.

The use of polystyrene film in window cartons used for paper items or other products not requiring protection from moisture is another good application. Many products included in this category, rolls of gift paper for one, are often stored for several months prior to being placed on sale. Polystyrene film will neither shrink and distort the carton nor will it expand and become wrinkled during this period, regardless of the storage conditions, providing, of course, the temperature does not exceed the shrink point of the film, about 185°F.

Polystyrene film is being tested as a window material in cartons for bakery products, candy, fresh meat products, fresh fruits, and vegetables. Results to date indicate the film is completely satisfactory for many of these products, but there are indications that the tendency of the film to fog and to transmit moisture vapor may be a deterrent to the use of the film for some of the others. However, the future availability of the coatings discussed earlier should eliminate these objections.

Pouches and bags fabricated from polystyrene film are being used to package a number of lightweight products, including nylon hosiery, handkerchiefs, rubber bands, hair nets, paper tags, and seals. The film is particularly well-suited for packaging nylon hosiery. The excellent printing obtainable on the film adds to the appearance of the package, the film is stiff enough to prevent the packages from sagging and drooping in display racks, and the clarity of the film enables the purchaser to select the exact shade desired. This particular use has been proved to be an excellent one by a series of extensive market tests.

It is expected in the future that a large number of products, including novelties, paper goods, candles, greeting cards, textiles, and some food items will be packaged in polystyrene film bags.

The closure of polystyrene film bags can be effected with pressure-sensitive tape, staples, ties, and thermoplastic-coated cappers.

Polystyrene film is being used as an overwrap on a variety of products, and the wrapping is being done on a number of packaging machines. The wrapping of tray-type puzzles and both rolls and sheets of gift wrap are examples. These products are often stored for several months after being packaged, and the dimensional stability and aging properties of the film are very much desired. The cost savings which result from the use of the film are also considerable.

The use of polystyrene film as an overwrap for fresh fruits and vegetables is being investigated. Tomatoes are being overwrapped with the film on a commercial basis, and indications are that this use should grow rapidly.

Activities concerned with the lamination of polystyrene film to paper and paperboard have been limited. It is possible such a laminate could be used in the construction of cartons with particular properties. The use of the film on the inside of the carton would give good resistance to oils and greases. Gloss and decorative effects could result from the use of the film on exterior surfaces of the carton.

Polystyrene film is being laminated to high-impact polystyrene sheet with heat and pressure. The lamination is easily accomplished at the extruder with a minimum of labor and auxiliary equipment. The film is used to impart additional

gloss to the base sheet. The laminate is ordinarily used for the interior surfaces of refrigerators.

Printed film can also be laminated to the sheet to produce display signs, place mats, and other products. It is possible the laminate could be subsequently vacuum-drawn to form serviceable and decorative containers.

This brief review by no means includes all of the applications for polystyrene film. Only the obvious and, in most instances, proven uses have been mentioned.

Although polystyrene film was first made 30 years ago, its use by the packaging industry is still in its infancy. The possible uses for the film have by no means been fully explored; nevertheless, the demand for the film is increasing at a substantial rate.

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Lee H. Wellock is a graduate of Ohio State University with a B.S. degree in pharmacy. Following his graduation, he joined The Columbus Pharmacal Company. Since that time he has worked in the control department, the laboratory, and the production departments. Prior to becoming production manager of the plant, he was a contact manager working with the different departments within his company. Mr. Wellock is a member of the American Pharmaceutical Manufacturers Association and Kappa Psi, professional graduate pharmaceutical fraternity.

Packaging management: The case for separate departments

By Lee H. Wellock,
Production Manager,
The Columbus Pharmacal Company,
Columbus, Ohio

Probably every production manager has wondered at some time or other whether he should have a single-department, integrated packaging line force or a series of separate departments within his plant. Although there is no hard and fast answer because conditions vary in each plant, the experience of Mr. Wellock and his associates sheds some light on the question. His decision to retain a set of separate departments deserves the attention of anyone concerned with packaging line personnel assignment and distribution.

Should we have a series of separate departments, or should we assign all our packaging line workers to a single department or pool? Like other manufacturers faced with many products, numerous container sizes, and package combinations, as well as great variations of run length, we need full flexibility of packaging personnel. For a long time we thought that having a set of separate departments represented the best practice for us. But since questions arose every so often about the desirability of separate departments, we carefully reviewed the pro's and con's of individual versus a single department.

Thorough analysis of our own situation convinced us we should keep our separate departments. In spite of this decision, our conscious study of the question and our frequent reviews of it were invaluabe in confirming our judgment.

Products And Packages

Having no proprietary items, our entire output is ethical, pharmaceutical products for the medical profession. As a result, our packaging is geared to the needs of the doctors. We produce over 200 different tablets, 40 ampule forms, 50 liquids, 4 powders, 18 ointments and 20 different capsules. We put our tablets and capsules into standard quantities of 100's, 1,000's, and 3,000's, as well as 16-, 24-, and 30-count packages for physicians' samples.

Our liquid items include 3-, 4-, and 8-ounce prescription bottles packed in dozens, as well as the same liquids in pints and gallons. We also use polyethylene squeeze containers and collapsible metal tubes for certain items. Our ampules include 2 to 10 cc ampules; these are packaged in 12's, 25's and 100's. We also have 10 cc and 30 cc vials, packaged in singles, half dozens, and dozens.

Our basic packaging equipment includes ampule filling and sealing equipment, capsulating machinery, a tube filler, ointment, powder filler, equipment to fill liquids in quantities from one-half ounce to one gallon, as well as label gluing equipment. We have our own printing department that not only prints labels as needed, but also prints a variety of technical and sales literature.

Locating our facilities. We have four principal departments to do our packaging. These include ampule, capsule, and tablet departments, as well as one handling liquids, ointments, and powders. These are physically located so as to meet their particular needs and are separated from each other. Our ampule department has an air-conditioned area, the capsule department is in a glassed-off section, and the tablet and liquid packag-

ing operations are located along two different walls. Thus, we provide reasonable space between the different operations.

Flexibility Necessary

An obvious problem is that we have many container and product changes, frequent shifts of orders, and great variation of run length. It is extremely difficult to balance an operation of this sort. For example, note the difference in speed between running plain and coated tablets. Likewise, the length of time necessary for the assay may vary. Also we have to have packaging line flexibility in order to meet the needs of a continuous flow of production and of the various materials and services leading to it.

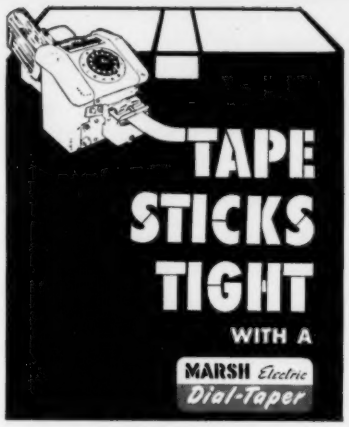
Structure of departments. The keystone of our packaging operation is our organization into four departments, each with a department head. All of our packaging people have considerable experience. Some of them have been with us many years. The desirability of these jobs and the favorable working conditions in our plant are conducive to long continuity of service by our packaging people.

We keep these workers more or less intact in their respective departments. As a result they function as teams. Our department heads have time to do a share of the work, in addition to supervising the people under them. We disrupt a team only in case of emergency, as when faced with a special or sudden need for service elsewhere. Department heads almost never leave their teams.

The team spirit prevalent in our departments, plus the physical separation of these departments on our packaging floor contribute to specialization. We note that our teams tend to eat together in our dining room—each group at its own table.

Have Single Departments?

In spite of the efficiency inherent in teamwork continuity and spe-



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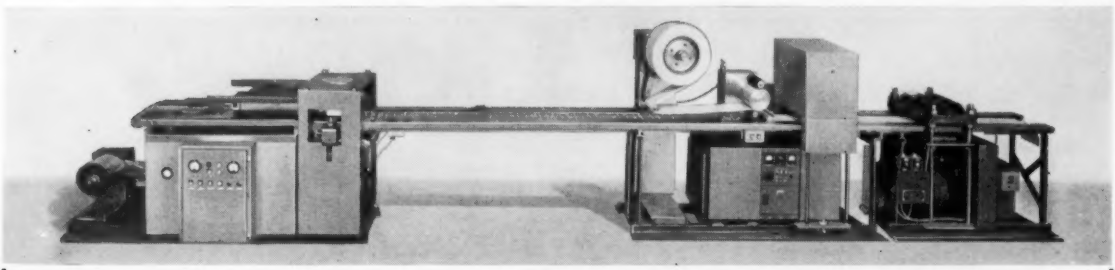

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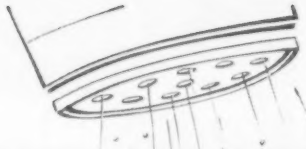

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cialization, we often thought it would be practicable to have a single packaging department instead of four departments, each with a department head and four or five workers. We considered having a single packaging department with one head and some 25 workers assigned to it. The idea was that we could draw from this pool in assigning people to the varying packaging tasks, as the daily workloads appeared. We thought it would mean less disruption of individual departments, less balancing of one against another as to emergency or priority of particular work. We thought we could avoid the pitfalls inherent in the reluctance of one group of specialized workers to tackle the chores of another group.

It takes skill and judgment to balance a workload between equal departments. If you want to take people from one group to help another when under the stress of a peak load, the department being stripped may question the urgency of the suggested transfer.

Preserving our departments. In spite of the attractiveness of a single department set-up, the more we looked at its possibilities, the more convinced we became that we should retain our separate departments. A major reason for not combining our packaging departments into one is that we did not want to make casualties of the department heads. Obviously we should only need one head for a single department. We decided the experience and leadership of the other department heads were too valuable to lose. We would get our flexibility at too great a price.

Likewise, having a pool would destroy the spirit and tradition of *esprit de corps* that now exists among our packaging teams. People assigned from a common pool would need specific direction for each assignment. They could not go ahead on their own, as they do now within their respective departments.

Variation of run length poses a serious problem. A difficulty with

a pool type of operation would be that it is hard to balance the workload when a job or run requires only two-thirds of a working day or two-thirds of the packaging force. Serious questions arise regarding the handling of the other third of the work and of the packaging personnel. Our work flow does not lend itself to devoting an entire day to one product and letting everything else wait until that job is finished. We have experimented with doing one type of work on Monday, another on Tuesday, and so on. However, too many variations arise.

Move work, not people. The problem of preparatory jobs and the supply of services to the main flow of work create difficulties. Jobs are not of equal length in time. Incidentally, when needing assistance by one department to handle the work of another, we often move the work, not the people. Instead of sending the packagers from their own to another department to help out there, we shift the packaging work to their area. In spite of the specialization, there is enough similarity in certain finishing tasks to permit doing this advantageously.

Another point in favor of retaining separate departments is that we have organized our plant to serve these individual units rather than a common area of packaging activity. For example, department heads deal directly with maintenance men—who are on duty all through the working day. Likewise, each department has a porter who services it, brings up containers and product, and takes away finished work. Each porter is available to clean up breakage and damage immediately after it occurs in each department.

Problems Of Training

Training is a department responsibility. The girls acquire techniques within their own departments, even though these techniques are common to other departments. We find that the real differences are between the large

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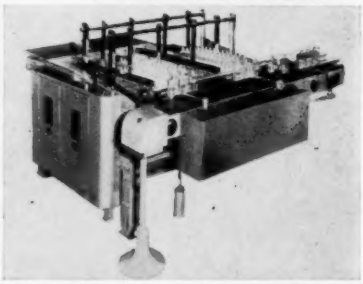

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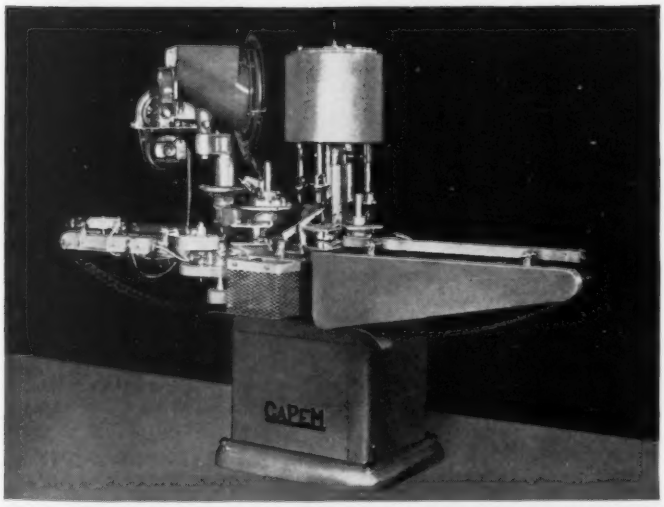

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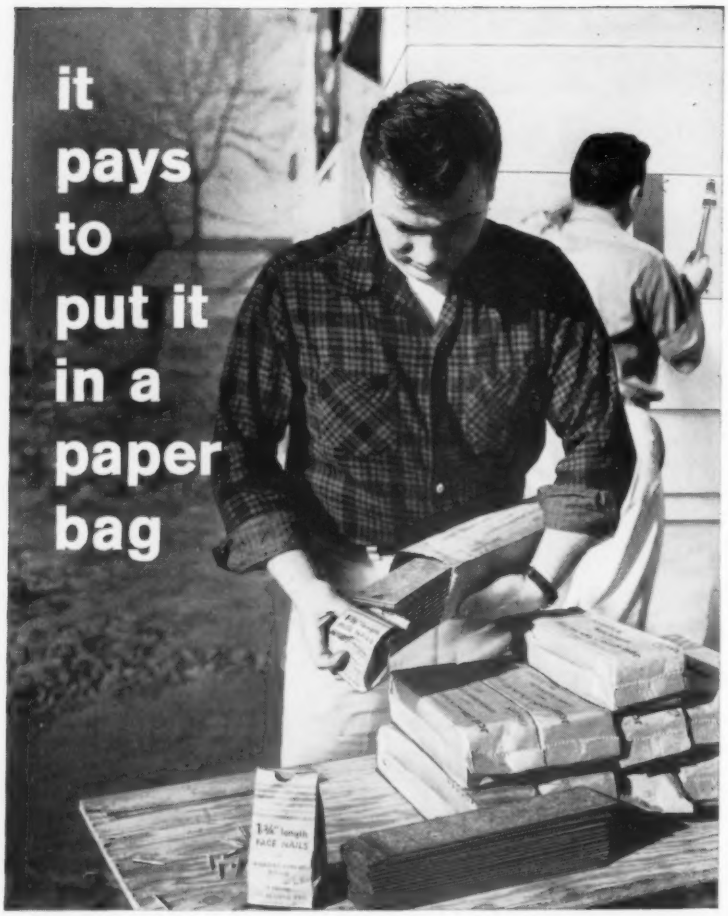

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and small containers within a department, rather than between different types of containers of comparable size. Even so, we occasionally shift packagers back and forth to do such specialized work.

The filling of small sample vials is a particular problem. As a rule, only two out of any five girls learn to do it well. Likewise, some are better at sample packaging work than others. Packaging of physicians' samples require close attention to detail. Some workers are admittedly too nervous for this kind of work and find themselves well suited to other types of packaging line jobs.

Watching for aptitudes. All this emphasizes our personal attention to our packaging line workers. It is our management responsibility to know those among our people who are temperamentally suited to particular tasks. We watch for natural aptitudes of one kind or another. In sizing up candidates for packaging work, we look for personality, health, family stability, background, aptitude, probable skill, education, and adaptability.

We insist that both the worker and the company consider a job on a trial basis for the first four to six weeks of employment. We emphasize that this is mutual, and that both parties must be satisfied. We are just as particular about a worker liking the job and wanting to be part of a team as we are in ascertaining that the company and the department head are satisfied.

Mutual Emergencies

Another key to personnel effectiveness in our plant is the mutual consideration of each other's emergencies. Occasionally our packaging people need time off to take care of personal business—such as to visit a bank, see a lawyer, look after some family property, or attend to some personal emergency. It is our custom to give them this time off—with the consent of the department head. We make a special effort to be considerate of the needs of the workers in this respect, and we note that they are careful not to

take advantage of our inherent solicitude.

Meeting our emergencies. On the other hand, we find this makes them considerate of our emergencies. When a rush order or some special job such as a mailing to physicians comes along, our packagers extend themselves to meet it. They often take shorter lunch hours or put in extra time in order to complete some job. This is one of the intangibles of packaging line management that definitely contributes to the successful operation of such a diversified flow of activity as we have. Because we are considerate of our workers when they need time off, they are considerate of us when we have to rush out a special mailing or other urgent job.

Department Loads Vary

Another consideration against having a single department is the variation between some of these departments. For example, men are basically not good at finishing work. Therefore, women do and are in charge of most of this activity. An exception is the ampule department. This is in charge of a man. He can handle the filling and sealing machinery. Our ampule girls fill and seal. A man's mechanical aptitude facilitates his keeping the equipment going and lets him set up the work so that the girls in the department can handle their part of it. Also, the ampule department head is involved in production. He has compounding and blending responsibilities. Two of our girls assist him in compounding the solutions.

While these considerations also apply to our capsulating operation, we have a woman in charge of this. We have found that she can do this as well as the finishing tasks. This activity is distinguished from the ampule operation because manufacturing is involved in it, while with capsulating the product is finished. In effect, the girls are merely packaging or filling capsules.

Keep separate departments. It may be that our conclusion to keep separate departments stems from our having built up a work force of long experience and continuity. If one were building a new plant from the ground up and establishing a new pattern of operations, it might not be feasible to set up separate departments where work is as diversified as ours. However, in spite of the drawbacks of separate departments, our experience with them has been so good that we are not tempted to discard them simply to gain whatever efficiencies might inhere in a centralized or pooling arrangement.

EDITOR'S NOTE:

Readers should observe that Mr. Wellock's carefully reasoned analysis stresses the impact of custom and tradition within his company—both as to personnel and as to its physical facilities. Perhaps other readers similarly situated have different views. In any case, because of the overriding importance of managing the packaging function, we welcome comments.

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Lawrence Eisen has been associated with Reliable Packing Company 20 years. Prior to attaining his present position, he spent eight years in the supervision of processing. Before that he was a department foreman. His special studies include management courses taken to supplement his practical education and experience.

Correcting the causes of package defects

By Lawrence E. Eisen,
Superintendent of Processing, Reliable Packing Company, Chicago

Successful automatic packaging rests on close coordination of machinery and materials, but the intricacy of mechanism and the normal variations found in manufactured parts and materials dictate close supervision. Mr. Eisen asserts that the ability to spot defects in completed packages and quickly relate them to machine problems is an important key to sustained operation. His suggestions for maintaining a flow of material, detecting and curing poor cutting and sealing, and making prompt machinery adjustments are a working guide for anyone concerned with getting the most from automatic machinery. Although discussed in terms of wrapping machinery, his practices add up to a method or tool applicable to a wide range of operational problem-solving.

There are two ways of spotting the difficulties that keep you from having a trouble-free packaging machinery operation. One is to go over your machines step by step, making sure that material is going through properly and that packages are forming correctly. But this does not always help you find the sources of trouble as quickly as you would like to find them. Perhaps our second way is better: Study the completed packages, quickly spot their defects, and then relate these defects to the particular parts or areas of the machinery itself.

Obviously, anyone can take a package that is poorly sealed, improperly folded, or otherwise unacceptable, and say that it is unsatisfactory. The important thing is to tie these troubles in with the probable machine or material factors causing them. The important thing is to do it quickly. Time is expensive when an automatic packaging machine is down. Another expensive element is the time lost due to rewrapping and rehandling of defective packages having to be done over. Also, there is some loss of material. Occasionally this mounts up to a sizeable amount.

During an intermittent or slow operation, the quick spotting of trouble is not critical. But when all packer stations on a given line are running, there is a rather steady flow of material to the automatic machine these stations feed, and jams and stoppages have to be cleared quickly.

Study Package Defects

The heart of the technique is being able to pick up a package, immediately analyze what is wrong with it, and then go directly to the part of the machine causing the difficulty—and correct it, thus resuming normal operation!

A package may have holes burned in it, show poor folding, have film that is not overlapped properly, show signs of burned or scorched areas, be wrinkled, evidence poor wrapping, or have a poor appearance revealing that film is not being held tight enough. You have to think of these things in terms of the machine area causing the trouble. (See Fig. 1)

Have proper flow. But before getting into the solving of specific problems, the first step is to make sure of a proper flow of film through, for instance, an overwrapping machine. Likewise you have to be sure that the preliminary or preparatory packaging operations that feed this automatic equipment are done properly.

Our bacon packaging operation illustrates our approach to these practices. We have working stations where a battery of girls put slices of bacon into folding cartons,

weigh them, fold and lock the carton tucks, and place the completed packages on a conveyor leading to the overwrapping eqiupment. At the end of this conveyor the packages move on a drop-off chute which delivers them to the infeed serving a Hayssen overwrapping unit. (See Fig. 2)

Avoid Jams At Chute

Our use of this chute makes unnecessary having a girl to transfer packages. Our only problem here is that the packages are not timed; any package landing on top of a flight bar has to be straightened or it will jam when it gets into the machine. The same girl who watches the overwrapping machine and loads completed cartons into corrugated boxes also keeps an eye on the infeed of packages. Irregular order and uneven spacing of packages moving down our conveyor belt precludes having a timed operation.

Use a square box. Overwrapped packages go down the outfeed conveyor, then pass through a Great Lakes shrink tunnel. In contrast to the usual "igloo" type of tunnel, this is a square box arrangement specially designed for bacon packages. The purpose of the tunnel is to shrink the film so that tight packages result. Whether we use a stretched film, cut and rewound to our requirements, or a film that is stretchable but not yet stretched, the result is the same. The film contracts when exposed to the heat of the tunnel, giving a tight overwrap. (See Fig. 3)

Note Material Variances

In working toward an effective flow of material through machinery, you have to consider the unavoidable tolerances and variations inherent in the film manufacturing, converting, and rewinding operations. They emphasize the need of developing the knack of adjusting machinery to compensate for that. Many variations arise in film. There may be quite a bit of nonuniform stretch. There may be

Fig. 1. Careful study of defective package should indicate a prompt remedy. Package (A) has no side seal; package (B) reveals hole burned in overwrap while going through shrink tunnel, and package (C) has no center seal. This last condition indicates roll not properly centered. Condition (A) may indicate package not being held tightly, while condition (B) suggests variance in film gauge at that point to make it vulnerable to burning.

Fig. 2. Packages move on this drop-off chute and pass to infeed conveyor of overwrapping unit. Irregular order and uneven spacing of packages preclude having a timed operation. As a result, girl must watch package flow to be sure one does not land on top of a flight bar. If one does, it requires straightening prior to entry at overwrapper.

tightness in the center, even though the edges or sides of a roll are loose. Or, one side may be tight and the rest of the roll at that point quite baggy. There may be slack or looseness across the web. Gauge variances arise at times.

Not in one place. It is important to remember that these variations are not static and do not stay in the same relative position throughout the roll. Excessive amounts of stretch or slack move back and forth across a web as the roll feeds out. A sag is not uniform along one side, but drifts from area to area across the roll as the stock goes through the machine. You may have limp film or blocking, for example, in one corner, thus

Labeling Lines

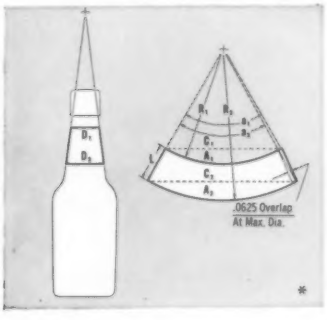
by George L. N. Meyer, Jr.

DETERMINING THE SIZE AND SHAPE OF WRAP-AROUND NECK LABELS

In previous articles of the "Labeling Lines" series we have discussed the importance of establishing standards *as the best means of attaining efficiency on your production line.*

As an example let's explore a simple mathematical equation that is followed by most everyone faced with making a neck label contour. To our knowledge, this has never been published before, but it has been used successfully, for many years. It would seem that this is good "file" knowledge for anyone in the packaging industry.

There are many instances in which a label contour can be determined by graphic means instead of mathematics, but in using the mathematical method there can be no question about accuracy.



The most important dimensions involved here are Chords C_1, C_2, and Height L. Once you have established these, you can easily check your neck label at any time to determine if it is up to your *standard.*

We specify an overlap of 1/16" as minimum for maximum bottle diameters at the top and bottom sections of the neck where the label is being applied. The glass tolerance at this section, because it is so close to the finish, usually does not exceed ± 1/32". The ideal overlap then becomes 5/32" ± 3/32".

If the glass tolerance exceeds ± 1/32", the overlap on the small glass would then be greater than 1/4" which is not desirable from a labeling viewpoint. When the glass tolerance is greater than ± 1/32", it is best to design the label around the glass size which the glass supplier expects to be more prevalent.

If this simple method is used to establish a *standard,* you will experience far fewer problems with efficient application of wrap-around neck labels.

D_1 = Max. Dia. (Top)
D_2 = Max. Dia. (Bottom)
L = Height of Label

$$R_1 = \text{Top Radius} = \frac{D_1}{D_2 - D_1} \times L$$

$$R_2 = \text{Bottom Radius} = R_1 + L$$

A_1 = Length of arc at top of label
$= \Pi D_1 + .0625$

A_2 = Length of arc at bottom of label
$= \Pi D_2 + .0625$

$$a_1 = \frac{A_1}{2 \Pi R_1} \times 360°$$

$$a_2 = \frac{A_2}{2 \Pi R_2} \times 360°$$

C_1 = Top Chord $= 2R_1 \sin \frac{1}{2} a_1$
C_2 = Bottom Chord $= 2R_2 \sin \frac{1}{2} a_2$

*Enlarged print on request.

retarding the free film movement.

Correct Feeding Of Film

A primary step towards a smooth-running machine operation is the proper centering of a roll before threading it through the machine. Since the cutting and wrapping operation takes place automatically, correct alignment is very important.

To use the particular films now employed for bacon wrapping in our plant, we installed an extra idler roll and moved the location of one of the other rolls. We did this to have our film pass under this idler roll in order to straighten out the film. The purpose of this roll is to spread the film to that it does not jam. In other words, we want an even distribution of film at the point it enters the wrapping operation. If you don't spread your film out by one such means or another, the film jams or piles up in the center. If the film is limp, it usually has a tendency to work toward the center and thus jam. (See Fig. 4)

Watch the rolls. Careful attention to the various rolls is important to insure a free flow. Sometimes the smaller rolls within a mechanism become "frozen" and do not turn freely. If they are not floating as they should, there is likely to be jamming of your film. In many instances, a jam occurs because the feeding of material continues, but it does not go out or be taken away by the mechanism. As a result, it stacks up in an accordion fold pattern and accumulates at one point or another in the machine.

Watch Trigger Feed

If no stock is coming through and there is no jamming, your trouble may be in the trigger feed. It pays to check the bars and the cam action that causes the stock to feed. If there is trigger trouble or if the feed mechanism is out of timing, the actuating movement does not take place and the stock fails to feed. Likewise it may be that the gear governing this is not

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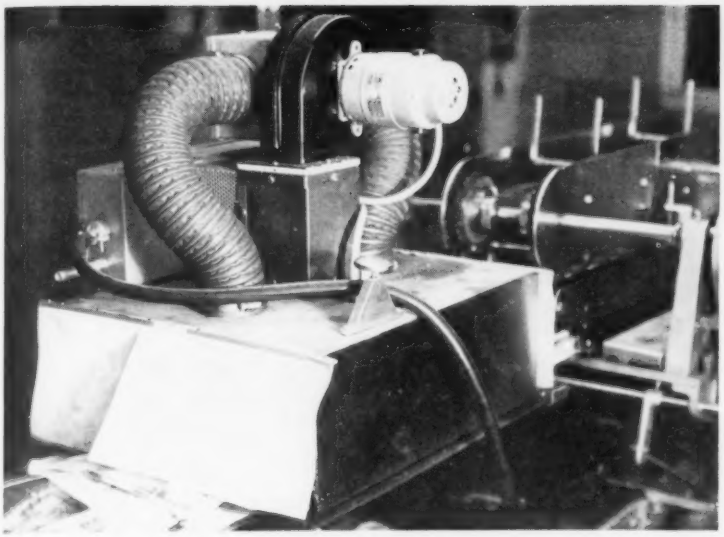

Fig. 3. Overwrapped packages move from right to left through this square box type shrink tunnel. When exposed to heat of tunnel, film contracts, thus giving each package a tight overwrap. Uneven heat at this point may be due to clogging of holes. Occasionally lumps of shriveled film are drawn into blower.

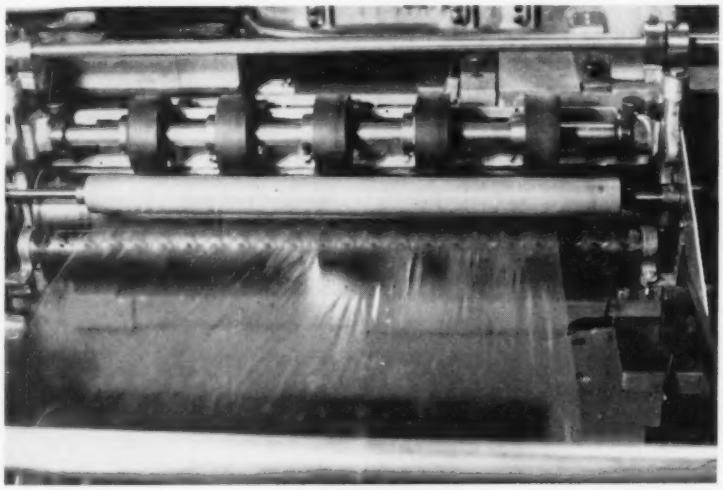

Fig. 4. Installing an extra idler roll permits having film pass under roll to help straighten film. By spreading film in this manner, there is an even distribution of film at entry point and an avoidance of jamming. Any limp film tends to work toward center area and hence will jam.

turning. The point to remember is that these details require attention if you are to have a smooth, steady flow of material through the machine. (See Fig. 5)

How about the cutting? A quick check of completed packages may reveal that there is poor cutting or cut-off of film prior to the individual overwrapping. This immediately suggests taking a look at the cutting action. You may need to adjust the tension on the springs that hold the cutting knives in tight position for a clear cut—like a scissor action. Also, the knives may be dull. These require sharpening regularly, perhaps once a month. (See Fig. 6)

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Fig. 5. If no stock comes through and there is no jam, trouble may be in trigger feed. If so, one should check bars and cam action. Gear governing stock actuating movement may not be turning. Details like this require close scrutiny.

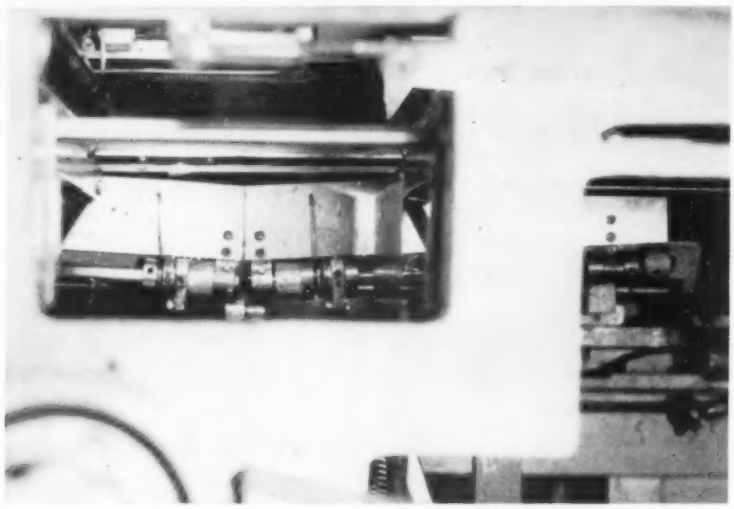

Fig. 6. Poor cutting may demand adjustment of tension on springs holding cutting knives in tight position. It may indicate dull knives—these knives require regular sharpening, perhaps once a month.

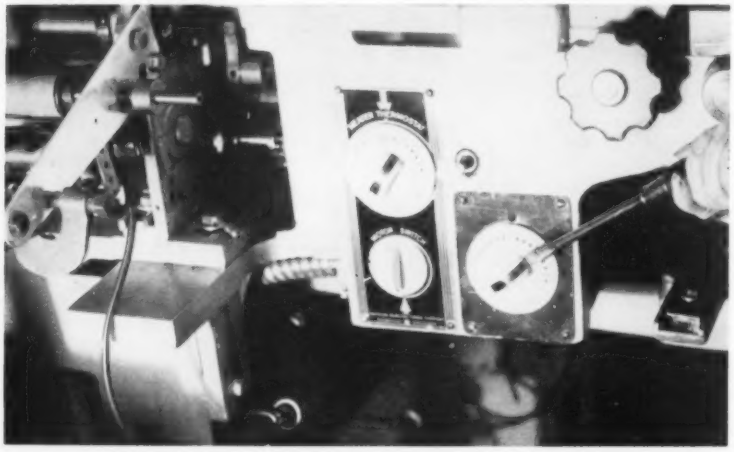

Fig. 7. Poor sealing may be due to lack of heat and this may indicate nothing more than a loose dial. These occasionally need tightening. Heat may not be what dial reads because of dial being loose and hence off register. Prompt attention to these elementary points pays dividends.

sticking of film at the time it feeds out of a roll. We think the dust on the film contributes to the dulling of our knives. However, the advantages of dusting far outweigh the disadvantages or harm due to the dulling action.

Check On Poor Seals

Another common package deficiency is a poor seal. For example, a poor center seal. It is necessary to be sure that the roll itself is centered. If the roll is not centered, there may not be a good center seal. If the roll is not wound properly, it may shift. If it is correctly wound, it holds its position but variances may arise. For example, difficulties come up in the course of splicing a roll. A splice may result in stock being one-eighth of an inch off. If there are no splices, a roll probably goes through satisfactorily. But if there are splices, variations arise resulting in poor center seals.

Need correct timing. Another reason for a poor center seal is that the front and back tuck parts of the mechanism are not properly timed. If they are not carefully adjusted and in as nearly perfect timing as is attainable, you do not get a tight pull and do not have the overlap necessary to a good package.

Many package troubles trace to heat sealing difficulties. Careful attention to equipment pays dividends. With our film currently used, we have a center heat seal temperature of 260° F. and a side seal temperature of 275° F. The difference is that with the center seal, there is just one thickness of the film to seal, while the side seals represent two thicknesses being sealed to a third thickness.

A Lack Of Heat?

An obvious starting point is to check for lack of heat if the sealing is poor. Sometimes it involves merely a loose dial. (See Fig. 7) These occasionally need tightening. As a result, the heat may not be what the dial reads because of the dial being loose and hence off reg-

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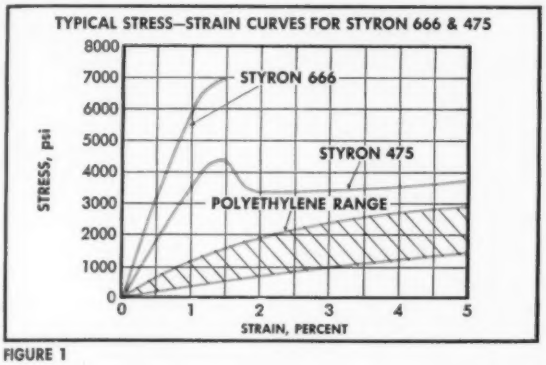

FIGURE 1

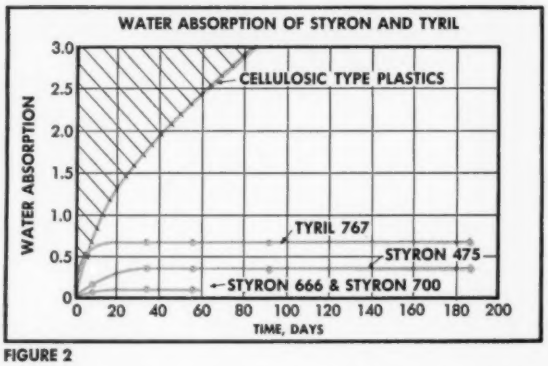

FIGURE 2

Reaching the absolute ideal in a package is often so costly that the engineer is required to settle for only those properties he must have. In making this decision he often decides in favor of the materials he knows best, even though a better package may be available at less cost. You should know, then, that plastics in general offer unusual packaging opportunities, and that the Styron® family offers an ideal balance of rigid packaging properties.

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ister. If you are getting a good wrap but have no seal, it is either that the heat is inadequate or that the heating bar is not contacting the package. Normally you check the heat first. It is extremely rare, almost improbable, that the bar mechanism does not rise, but such a possibility is worth noting. What happens is that the heater rises to contact the film during the instant of dwell time.

Package not held properly. Sometimes it happens that the final side seal does not have enough heat, or there may be a poor seal. If the seal is poor but the heat is adequate, it may be that the package is not being held tightly enough against the heat by the rollers. It may be necessary to raise or lower the rollers.

Tension And Rollers

In this connection, too much tension causes a burning of the package instead of a sealing action. At the same time, not enough tension means a poor seal or sealing only the fold and not sealing the fold to the package itself. For this reason, it is necessary to have the floating rollers in proper adjustment. These are heavy enough to hold down the package, if properly adjusted. If the side fold is not being made properly, it may be well to check that area of the machine.

Things catch in crevice. Foreign particles may be caught in the crevice of the folding area. A piece of film, a shriveled-up wrap, or some other foreign piece may get into that area. As the metal members at this point are shaped to make the fold, the folding is done below the surface of the package. As a result, if anything is lodged in the crevice, the material cannot come through neatly to make the fold.

Another form of difficulty may arise from the use of the shrink tunnel. If a package is not shrunk into its correctly tight form, it usually means there is not enough heat in the tunnel. Typically, a unit such as ours uses 170° F. This

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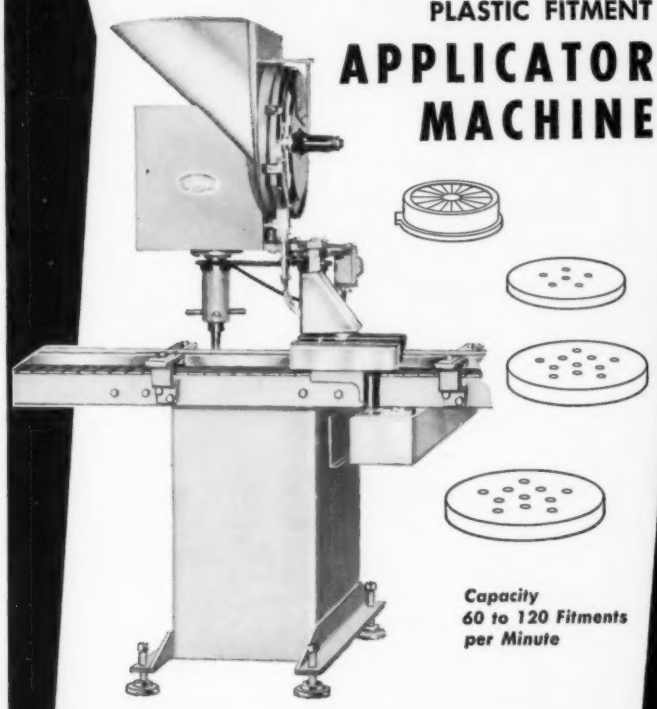

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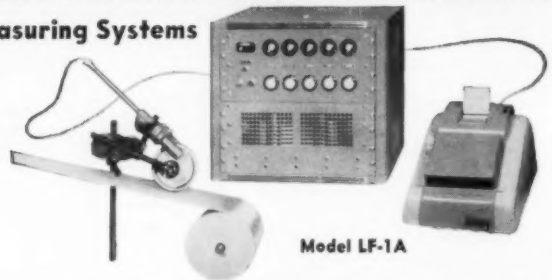

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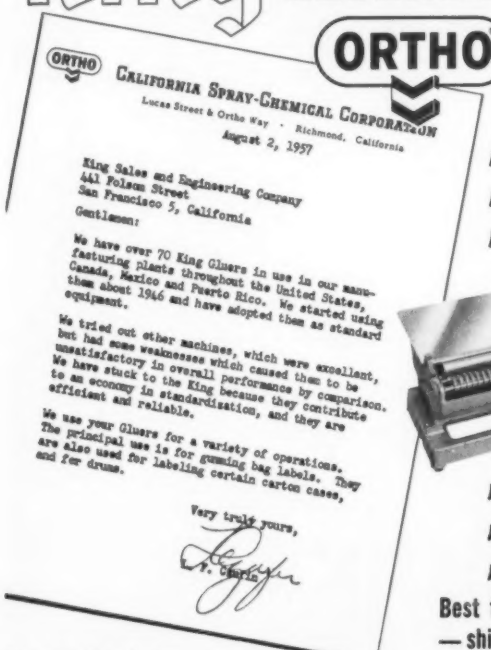

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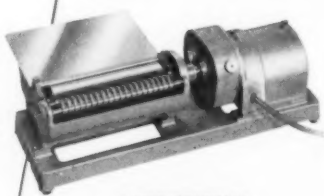
- POSITIVE CONTROL
- EASIEST CLEANING



- ECONOMICAL
- VERSATILE
- EFFICIENT

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King SALES AND ENGINEERING CO.
441 FOLSOM STREET SAN FRANCISCO 5

is adequate for shrinking the films we currently use. However, some films do take more temperature.

Blocking Of Holes

In checking the heat at the tunnel, it may be that something is interfering with the movement of air in the tunnel. Some of the holes may be plugged up and the heat may not be in uniform distribution. It is necessary to clean them out (or at least check them from time to time) to be sure that none is obstructed. Uneven feed usually means that holes in some places are plugged up and that all of the heat is going out through the remaining (unplugged) holes instead of through all of them.

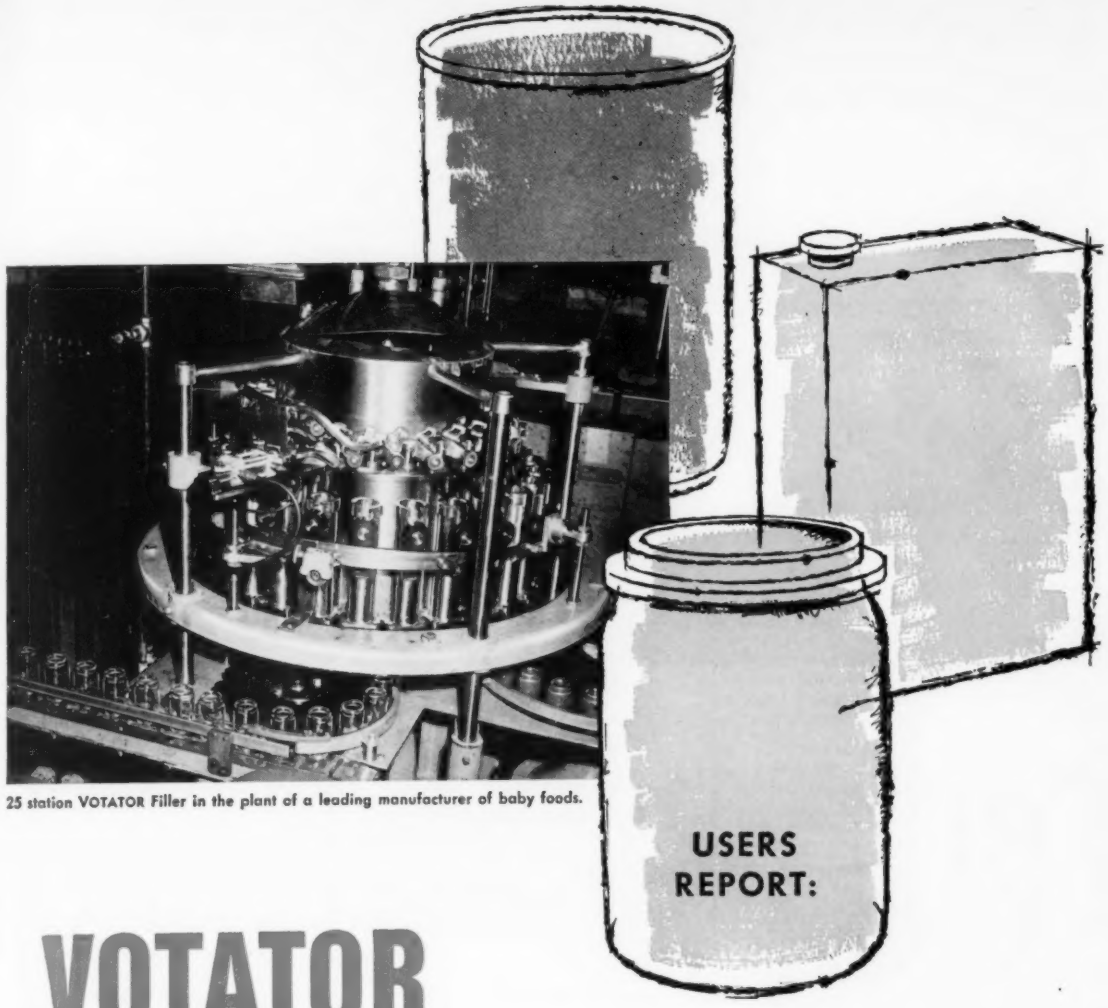
On the other hand, spot burning may be due to variances in the film itself, rather than to any deficiency in the heating action. If there is too much heat resulting in a burning of the package, it is possible that the gauge of the film may have changed in the process of going through a roll. You should not assume that improper or uneven heating is due to the equipment; it may be the film.

Shrivels into lump. Sometimes a loose wrap, such as an incomplete package wrap, or an entire wrap will be shriveled up in the tunnel. As a result of the free shrinking process, it shrivels up to a small lump. If so, this wad of film may be drawn into the blower fan. However, if this happens you will know it immediately because there will be a banging inside the tunnel.

Why Film Jams

Jamming of film in the process of machine action is a common occurrence. If packages are coming through without film, it means that the flow of film may be jammed in one corner. Unevenness of film may be a problem of being similarly jammed. The technique then is to pull the jam, cut the jammed piece free, and let the movement of the web continue.

(*Continued on Page 62*)



25 station VOTATOR Filler in the plant of a leading manufacturer of baby foods.

VOTATOR® FILLERS

step up speed...improve accuracy

New, higher standards of packaging economy are being realized by processors of a wide variety of products by using the new VOTATOR* Fillers. These rotary piston fillers are giving close-tolerance filling of liquids and viscous materials at remarkable speeds. No-container-no-fill controls safeguard against interruption of operations and waste. Moreover, costs are being cut by features which assure superior sanitary conditions, and continuous, low-maintenance operation.

VOTATOR Fillers are available in a wide range of types and sizes . . . and can be supplied *promptly*. Girdler gives you the benefit of its 30 years' experience in the processing field to assure proper integration of processing and packaging. Write for Bulletin PED 257.

* T. M. Reg. U. S. Pat. Off.

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Electronic Checkweigher

Bartelt Engineering Co. has developed a constant motion electronic checkweigher that classifies packages by weight at speeds up to 200/min. The machine has an accuracy of acceptance of plus or minus 1/64 oz. A polyester belt is driven at a constant speed over a platform which is attached to an electronic weighing head. Photoelectric eyes control the sequence of the weighing operation, automatically meeting the varying output of the infeed conveyor. The weighing head transmits a signal that actuates the segregation gate; packages that are underweight are rejected from the conveyor belt, while overweights are shifted to one side. Circle No. 1.

Adhesive Applicator

Angier Adhesives Div., Interchemical Corp., has designed a portable applicator for easier dispensing of its "Double-Face" adhesive film. Double-Face is a pressure-sensitive transfer film supported by a double-coated release paper. When applied with the applicator, the film is separated from the release paper and transferred to the work surface. The applicator accommodates widths of Double-Face from 1/4" up to 1", in rolls of 72 lin. yds. This adhesive film

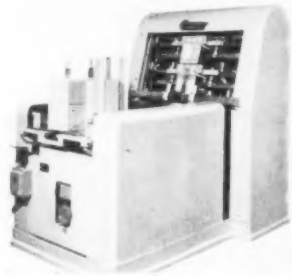
is suitable for patching and lapping plastic films and in specialized package assemblies. Circle No. 2.

Increased Load Limit

Tri-Wall Containers, Inc., announces a design improvement in triple-wall corrugated fibreboard which increases the permissable load up to 40%. The load limit increase has been accomplished by employing a medium fluting in the outer corrugated section, and large flutings in the intermediate and inner corrugated sections, with outer liners of 90 lb. basis weight kraft paperboard and 42 lb. basis weight for the intermediate liners. The equivalent industrial designation is C-A-A fluting arrangement. By virtue of the increased structural strength of this improved board, the carrying capacity has been raised to 350 lbs. from the former maximum of 250 lbs. The increased load limits and the improved fluting arrangements have been incorporated in the newly-published interim specification governing shipments to the military procurement services, namely, PPP-B-00640a (USAF), an interim revision of PPP-B-640. Circle No. 3.

Poly-Coated Carton Sealer

Peters Machinery Co. has a new machine, the Model SG-P, which forms and heat seals poly-coated blanks to produce cartons and trays which are highly resistant to grease and moisture without liners. Where added protection against grease and moisture is not required, the machine also forms and glues cartons and trays from low cost non-coated stock.



Model SG-P operates at speeds up to 180 or more/min. Circle No. 4.

Portable Bag Closer

Dave Fischbein Co. announces the Model CR portable bag closer, a machine driven by a non-electric air motor. This bag closer was designed for use under hazardous conditions such as gaseous and explosive atmospheres, or when handling inflammable materials. Total weight of the Model CR is 9-1/2 lbs., complete with a cone of thread. It is available with or without the Faseal taping attachment. Circle No. 5.

Imprinting Equipment

Cozzone Marking Co. has a line of

Candy, cookie-cracker, and similar plants frequently must package 20 or more different items and sizes. The giant volume items justify single-purpose, specialized weighers. But what about the remaining items which must be handled on a multi-purpose weigher? This new, semi-automatic net weigher with unique versatility and precision accuracy provides the answer.

Accuracy and Versatility...

get both with WRIGHT JUNIOR WEIGHER

Precise Wright's exclusive Hy-Tra-Lec® weighing precision guarantees pinpoint accuracy.

Versatile One ounce to one pound range, quickly adjustable. Easy change-over features including interchangeable spouts and weigh buckets.

Gentle Bulk and dribble vibratory feed handles the product with extreme care, and the weighed charge gently slides into the awaiting bag, box, jar, or can.

Efficient This machine possesses the same quality design and construction characteristic of Wright's automatic systems.

Low Cost The Junior Weigher pays for itself from savings gained by its versatility and accuracy.

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automatic Micro-Printers, which feature switching of package imprints and code numbers during production changeovers. Loosening the cylinder nut permits removal of the plate cylinder sleeve for replacement with a new imprint. Available in 18 models offering a cylinder circumference ranging from 9" to 36", these Micro-Printers attach to any type of existing packaging machinery for imprinting on bags, cartons, and bottle tops. Circle No. 6.

Container Feeder

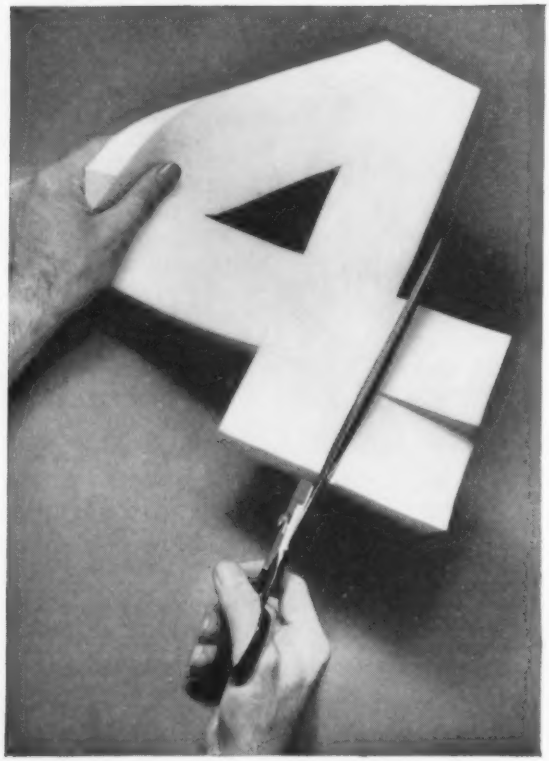
U. S. Bottlers Machinery Co. announces the U. S. Container Feeder, a machine designed to handle rounds, squares, panels, or ovals in glass, cans, or jars. Quick adjustment is made for containers from about 3/4" to 4-1/2" in thickness. As each row of containers advances intermittently on a moving mesh belt, a retractable discharge guide releases each row to the conveyor as fast as the preceding row has cleared. Variable speed ratio of 2-1/2 to 1 is regulated by the turn of a crank. To accommodate the number of containers per row as packed, six adjustable separator plates are supplied with a standard machine. Carton lint drops through the wire mesh belt into a dust collecting pan. Circle No. 7.

Capsule Banding Machine

Arthur Colton Co. announces development of Model 960, a banding machine that permanently seals hard capsules by applying a 1/8" wide band of clear or colored gelatin at rates up to 200 capsules/min. Unbanded capsules travel from a plastic hopper through a plastic tube to an escapement that places them in spring-loaded pockets. The capsules are closed and banded with gelatin applied by a serrated contact wheel driven by an individual 1/20 hp motor with variable speed drive. Banded capsules are then transferred to a drying conveyor by a vacuum transfer wheel, and after drying are air-ejected through a chute into a container. Circle No. 8.

Plastic Tubing

Minnesota Mining & Mfg. Co. has developed a thin-walled, distortion-free plastic tubing for use in pharmaceutical packaging. 3M's "Kel-F" brand halofluorocarbon plastics can now be fabricated into tubing with a 5-mil wall thickness that will not distort in steam or heat sterilization, according to Minnesota Mining. The tubing represents a reduction of 3 mils from the wall thickness previously necessary to withstand these types of sterilization. The new 5-mil tubing may also be formed into filled, sealed ampules and sterilized. "Kel-F" plastic is noted for its tensile strength (4,500 to 5,700 p.s.i.), its impact strength (3.6 lbs.) and its good heat-sealing properties. Circle No. 9.



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1. Urethane foam's high shock absorbency permits containers to be more efficiently designed to fit the requirements of the product and to cut down on the need for "free space" in the carton.
2. Urethane foam's shock absorbency is directly related to its density; and since density is a factor that may be uniformly controlled in the manufacturing process, all that need be calculated is the thickness of the cushioning wall needed to absorb impact shock in a given situation.
3. The adaptability of urethane foam to diverse fabricating and packaging techniques is almost limitless. It can be molded in place to almost any conceivable contour for form-fitting protection; it may be sliced, cut, heat-sealed, sewn, stapled, tacked or die-cut to meet the most intricate requirements of package design.
4. The red tape of investigation, the inconvenience of delay, and the damage to both goods and reputation caused by inadequate packaging, are all sound reasons for talking with a urethane foam supplier.

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Step up sales, cut labor costs . . . bundle your packages on the OLIVER

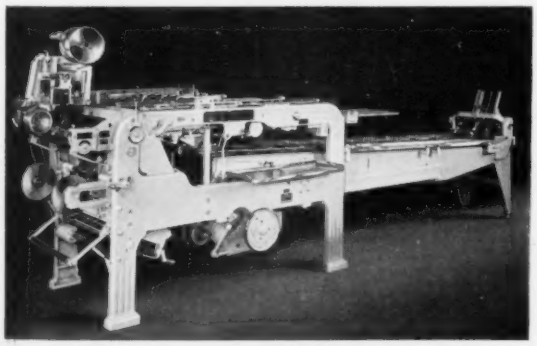
Overwrapping groups of packages into attractive bundles naturally increases unit sales. Distributors and retailers find bundled paper specialties, drugs, food items and similar articles easy to stock and handle.

The recognized quick-adjustability of Oliver wrapping machines makes them ideal for bundling. You can switch from endfold to underfold at the flick of a finger. Change for package size in a minute or two. Even with short runs, down-time is low. And the unusual range of sizes handled by Oliver wrappers is another money-saving advantage.

The Curad and Kleenex bundles grew popular overnight. The Oliver overwraps and zip-tapes 12 Curad packages to the bundle. It overwraps 8 Kleenex packages. These eye-pleasing bundles are neat and strong.

Get all the facts

Oliver engineers will help you decide the best way to bundle your packages. They will plan your line to synchronize the accumulating and feeding operations. Write for details.



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Pails And Drums

Vulcan Containers, Inc., offers an information sheet illustrating its line of steel pails and drums, with capacity ranges of 1 to 12 gal. These containers are available from stock in lined or plain interiors, in a variety of gauges. They are equipped with pouring spouts for both drum and lug cover styles. The company will ship a minimum order of 20 containers. Circle No. **101.**

Rotary Piston Filler

The Pfaudler Co. offers Bulletin 959, providing specifications for a 21-station rotary piston filler. Illustrations of mechanical drawings are employed to describe this unit. This machine packages viscous or semi-solid products at speeds up to 500 cans/min. Its accuracy is rated at + or — 1/10 fl. oz. This machine features a high-speed "no container—no fill" mechanism and a simplified changeover for different can sizes. Circle No. **102.**

Wrapping Machines

Oliver Machinery Co. Bulletin No. 550815 describes Oliver automatic wrapping machines. These units wrap a wide variety of articles of rectangular or irregular shapes such as cakes, cookies, candy bars, frozen foods, dried fruits, textiles, etc. They can overwrap cartons, trays, U-boards, and flat cards, or the product may be wrapped without any support. These machines handle waxed paper, glassine, cellophane, or almost any other heat-sealable material. This folder also describes a label imprinter and a package-top labeler that handles thermoplastic labels. Circle No. **103.**

Flexible Packaging Samples

Western Waxide Div., Crown Zellerbach Corp., is offering a sample kit that includes nine printed samples of some of its various flexible packaging materials. Included is a sample of the new C-Zip pouch-type laminated package with an easy opening tear string and a Mullinax carton, a waxed paper-paperboard lamination. Circle No. **104.**

Bundling In Cellophane

Olin Mathieson Chemical Corp., Film Div., offers an interesting bulletin which outlines the many cost savings made possible by bundling multiple packages in cellophane. Suggested basic bundling arrangements are for different shaped packages such as tall, flat, round, and irregularly-shaped objects. An estimate worksheet that can be used to compare present costs with the cost of bundling is provided. After the necessary basic information is filled in, Olin Mathieson will prepare the cost estimate comparison for you. Circle No. **105.**

Automatic Adhesive Control

Potdevin Machine Co. has published a new bulletin, No. CS-255, that illustrates with a photograph and diagram the operation of the Visco-Mat. This machine converts dry adhesives into a uniform liquid adhesive of correct viscosity and maintains that viscosity under constant control. It is said to be easily installed by connection to water and power supply. Circle No. **106.**

Polyethylene Blends

Semet-Solvay Petrochemical Div. of Allied Chemical & Dye Corp. offers Bulletin P/S 234. This bulletin lists the advantages of A-C polyethylene, an inert, low molecular weight polymer, which can readily be blended with waxes, polymers, and resins in hot melt or water emulsifiable grades. When added to wax coating, it improves gloss, reduces scuffing, and imparts a high blocking point, Semet-Solvay says. A checklist of product applications is included. Circle No. **107.**

Tubular Packaging

Niemand Bros. has issued an illustrated brochure describing its complete line of tubular paper packaging products. This brochure details its custom built and industrial packaging products, dispenser packages, goose-neck packaging, and similar units. Niemand says that its products can be designed and produced to a wide variety of specifications and requirements. Circle No. **108.**

Resin Adhesives

Paisley Products, Inc., has Bulletin No. 23 describing its resin adhesives. This twelve-page booklet contains details of adhesive structures, methods of manufacturing, properties available, methods of application, and contains a chart enumerating industrial uses of resin adhesives. There is a list of 17 specific suggestions for using these adhesives. Circle No. **109.**

Protective Packaging

Jiffy Mfg. Co. offers a specification sheet that enumerates the various grades of Kushion-Kraft that are available in sheets or rolls. This material is designed to provide surface protection and cushioning against shock. It consists of plies of processed and rugated paper in either kraft or tissue, or a combination of both. A specification table lists various weights in four different grades of this material. Circle No. **110.**

Package Labeling Innovation

Dennison Manufacturing Co. has a brochure describing a new labeling process called "Thermagraphy." This method involves the transfer of a preprinted label design from a roll of special label paper directly onto the unprinted packaging material. The result is said to compare with printed film and offers better adhesion, less bulk, and faster application than conventional labeling. It

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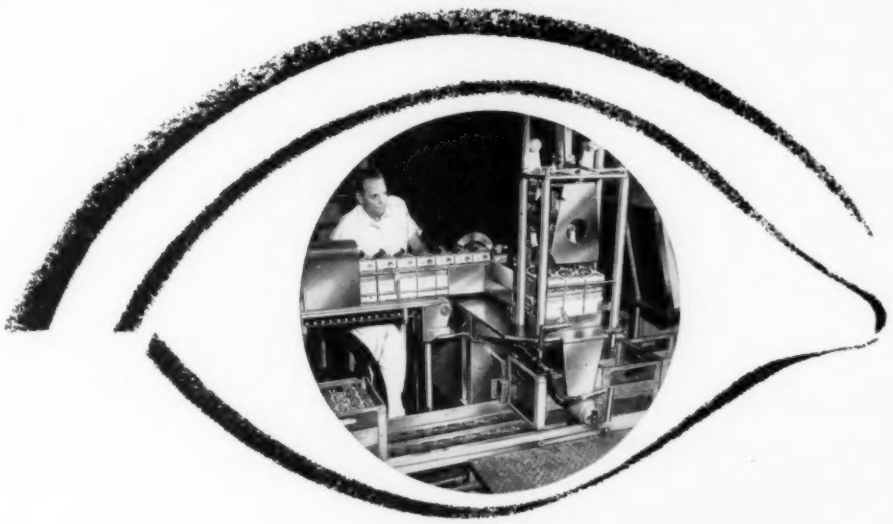

Carnation *reports Standard-Knapp Packer improves efficiency and package quality*

There is no substitute for the consistent dependability inherent in Standard-Knapp packaging machines. Take the Standard-Knapp Model 834 Milk Carton Packer, for example. Carnation Company uses this unit in its Fresh Milk and Ice Cream Division, Seattle, Washington. Result: improved efficiency in case loading plus improved package quality because of gentle handling.

Whether you package in a bottle, can, carton, bag or case, your chances of realizing higher productivity are better when you install Standard-Knapp equipment. S-K packers, gluers and sealers and other packaging machines are quickly amortized by production savings. Please send for literature, or, if you have a project on now, ask to see your nearest Standard-Knapp sales engineer.

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is suitable for reverse plate printing, halftones, and process color work. Transfer unit can be attached to wrapping, bundling, or bag making machines. Circle No. **111.**

Cellophane Data

E. I. DuPont de Nemours & Co., Inc., Film Dept., has issued Bulletin A-6166, a six-page folder listing physical properties, principal uses, yield, and thicknesses of 31 different kinds of its cellophane. Circle No. **112.**

Automatic Cartoner

Container Equipment Corp. describes its Model 40 cartoning machine in a current bulletin. It automatically moves cartons from flats in the hopper to the closing or sealing stations, allowing for hand insertion of the product. Producing sealed cartons up to 90/min., machine handles reverse tuck cartons, or any combination of these. Carton sizes handled range from 1" long, 1/2" wide, 1-5/8" deep, to 10" long, 5" wide, 30" deep. Circle No. **113.**

Pressure Sensitive Labeler

Avery Adhesive Label Co. has published a specification sheet on its new automatic pressure sensitive labeler. Labels are fed from a roll and the machine applies them into a registered position on flat, rounded, or concave surfaces. Standard machine handles labels from 2-1/2" wide to 1/4" wide, at speeds of 40 to 300 min. The machine may be modified to handle labels up to 6" wide. Circle No. **114.**

Carton Overwraps

Continental Can Co., Shellmar Betner Div., manufactures a foil-wax-tissue lamination called Bencoseal, used as carton overwrap or as box liner. Printed samples of this material are offered in a pocket-type brochure, which also outlines the characteristics of two different grades of this lamination. A comparative moisture table is included. Circle No. **115.**

Carton Filling And Sealing

FMC Packaging Machinery Div., Stokes & Smith Co., offers a new eight-page folder describing its complete line of Neverstop automatic carton filling and sealing machinery which handles free-flowing products. Specifications for six models of this machine are included, offering a wide choice of speeds, carton size, glue, filling method, and optional equipment. Circle No. **116.**

Corrugated Box Types

Union Bag-Camp Paper Corp. has an interesting brochure that gives a detailed description with photographs of seven representative standard corrugated box types that have proven practical for most shippers. Circle No. **117.**

Bottle And Can Packers

Standard-Knapp, Div. of Emhart Mfg Co., is offering an eight-page booklet on its 830 Series high-speed can and bottle packing machines. They are readily adjustable to varying sizes and styles of containers and to different types of packs. Circle No. **118.**

Tablet Counter

The Lakso Co., Inc., has a brochure available that describes its Model 55 rotary tablet counter. It fills bottles up through 100's at a rate as high as 300/min. This machine works well in conjunction with high-speed bottle feeders, cottoners, labelers, etc. It has two automatic check points to insure accuracy. Circle No. **119.**

Bag Closers

George H. Fry Co. has published a four-page illustrated folder that gives specifications and operating features of four different models of bag closing machines. These are continuous motion machines that will close and seal paper bags up to 3-lb capacity. It handles bags made of kraft paper, waxed paper, plain or waxed glassine, foil and paper combinations, using either adhesives or the heat-seal method. Circle No. **120.**

Fibre Cans And Tubes

The Cleveland Container Co. has a packaging brochure that provides detailed construction drawings of its line of convolute and spirally-wound fibre cans, tubes, and specialty metal closures. These packages are suitable for all types of dry, granular products in the food, drug, and chemical specialties industries, as well as for spare parts, hardware items, etc. Cans are lined with moisture, grease resistant, and anti-corrosive liners. Circle No. **121.**

Versatile Wrapper

Miller Wrapping and Sealing Machine Co. describes its Model MPS wrapping machine in an information sheet. It wraps boxes or open trays of foods, textiles, drugs, stationery, etc., using roll or sheet fed wrapping materials. It heat seals or glue seals with cold glue. Speeds range up to 21 pkgs/min. Package sizes handled are 2-1/2" wide to 15" long, 1" to 9" wide, 12" to 5" high. Circle No. **122.**

Engineer's Checklist

Riegel Paper Corp. has a packaging engineer's checklist for the selection of flexible packaging materials. This list not only covers 21 points which a packaging engineer must check, but also has an enumeration of simplified explanations of factors that arise in material selection. Circle No. **123.**

Granular Cartoning

Pneumatic Scale Corp., Ltd., describes its granular cartoning machinery in Bulletin 119. Profusely illustrated, it gives specifications for carton set-up, lining and sealing machines, gross weighers, and carton wrappers. These units operate at speeds of 30 to 40 pkgs./min. Circle No. **124.**

Saran Base Lacquers

Pyroxylin Products, Inc., offers technical data on its saran base lacquers, which can be used to attain improved grease resistance and water and gas impedence on many types of films and paper. Samples of various lacquers are also available. Circle No. **125.**

Electronic Counting Equipment

Post Machinery Co., Electronics Div., has several catalog sheets which describe various electronic counting machines. These include Model F-2, a direct impulse counter for slower counting; Model PW-5, a five selection preset counter which counts up to 5,000 units/min; Model LF-1A, a lineal footage counter and readout machine; and Model P3-RM, a counter for cartoning, etc. Literature is also available on Model ER-1, an edge register detector designed for more accurate control of materials manufactured in continuous form. Circle No. **126.**

Counting And Imprinting Machine

Pitney-Bowes, Inc., offers two pieces of literature describing the Tickometer, a counting and imprinting machine for automatically counting, dating, coding, and imprinting labels, tags, cartons, etc., at speeds from 500 to 1,000 pieces/min. A ten-page brochure, "Your Employees' Time Is Too Valuable to Waste," gives specifications and operating features of this machine. A separate bulletin of twelve case studies of savings attributed to the use of this unit is also included. Circle No. **127.**

Vacuum Filler

Machinery Service Co. has a brochure that lists various features of the M-S rotary vacuum filler. Available in 12, 18, or 24 filling tube models, the unit is designed for high-speed filling of any free flowing liquids, light or heavy, foamy or syrupy. Circle No. **128.**

Pillow-Style Packaging Machine

Lynch Corp. describes a new automatic packaging machine, the Model 100, in a current information sheet. This is a single-tube unit that forms, fills, and seals pillow-style packages at speeds up to 60/min. It handles solids, liquids, powders, and granules, packaging them in a wide variety of heat-sealable materials. This machine can produce a flat or fold-over seam seal in a package size range of 6" maximum width and from 4" to 12" in length. Circle No. **129.**

VPI Paper Calculator

Ludlow Papers, Inc., has published a handy booklet that presents the first available chart for simplified calculation of VPI paper requirements necessary to protect a given area. VPI papers are coated with a volatile chemical which protects ferrous metal products against rust. The booklet also includes four fundamental rules for properly handling this material. Circle No. **130.**

Industrial Adhesives

Permacel-Lepage offers a detailed catalog on its industrial adhesives. Included are extensive product write-ups on each of 28 different adhesives, giving the composition, properties, characteristics, bonding, application, and uses of each, as well as prices and ordering information. Circle No. **131.**

Molded Pulp Packaging

Keyes Fibre Co. lists the advantages of molded pulp shapes for interior packaging in a four-page brochure. Custom molded into varying shapes, this material provides contoured partitions that protect against shock and are particularly adapted to the low-cost packaging of fragile products such as fruits, glassware, electrical parts, fluorescent tubes, meters, etc. Circle No. **132.**

Feeder/Counter

U. S. Engineering Co. has a data sheet on its new Disc-O-Matic feeder, a centrifugal-type parts feeder designed for high-speed packaging. This machine can be equipped with a predetermined electronic counter. A gate mechanism automatically batches the continuous flow of parts into the containers provided. An automatic conveyor to remove the filled containers and position the empty ones is a standard accessory. Up to 400,000 units an hour can be counted with the DiscO-Matic. Circle No. **133.**

Net Weighers

Frazier & Son data sheet lists operating features of the Whiz-Packer net weighing machine. Available in floor models or bench models, these units handle chow mein noodles, candies, potato chips, pretzels, hardware, and other hard-to-fill products. Machine can weigh from below 1 oz. to 3 lbs. at speeds up to 30/min. Circle No. **134.**

Plastic Products

Delta Products, Div. Air Accessories, Inc., has released a colorful brochure, "New Shapes in Plastics." Products produced by vacuum, vacuum snap-back, drape, and stretch forming are pictured, showing the versatility possible with a variety of plastic materials. Circle No. **135.**

Cartoning Equipment

F. B. Redington Co. offers a folder on its new Automax, a single-operator cycle cartoner that feeds, expands, and places cartons in conveyor pockets. When the operator places tubes, bottles, or other solid or semi-solid articles in the three-place loading trough, and slides it forward to insert the product, the Automax closes the package by tucking in the end-flaps and discharges it to conveyor or packing table. Finished packages can be produced at speeds up to 45-50/min. Circle No. **136.**

High Speed Wrappers

Elgin Manufacturing Co. six-page bulletin enumerates specifications with photographs of the Model GSA fully automatic wrapping machine which is available in three models. Designed to handle heat sealing cellophane, waxed paper, aluminum foil, and glassine, this machine is adjustable within a speed range of from 10 to 80 pkg/min. Package sizes handled range from 3" to 12" long, 1" to 7-1/2" wide, and 3/4" to 3" high. A flow chart is included that shows the sequence of folding operations. Circle No. **137.**

Moistureproof Paper Coating

The Goodyear Tire & Rubber Company, Chemical Div., manufactures Pliolite S-7, a quality coating resin tailored for the moistureproof packaging field. A comprehensive data sheet, No. 56-3, has been published which lists the properties of this material and includes a comparative table itemizing the advantages of this material compared with cyclized natural rubber and nitrocellulose lacquer. Circle No. **138.**

(Turn Page)

Dial Tape Dispenser

Marsh Stencil Machine Co., Inc., offers Brochure D7-5, describing its electric dial taper. This machine automatically measures and dispenses any length of gummed tape from 3" to 39", cut off and moistened, ready to apply to container. Circle No. **139.**

Electromagnetic Vibrator

Syntron Co. announces publication of a new data sheet on its small V-2 electromagnetic vibrator, which is designed to vibrate diminutive hoppers and tracks and chutes of processing, assembling, and packaging machines. The data sheet gives a complete listing of dimensions and specifications of three standard models. Circle No. **140.**

Straight Line Labeler

Economic Machinery Co. Bulletin CM-264 lists detailed specifications for its straight line labeler. Equipped with a "no bottle-no label" control, this machine can apply one, two, or more labels on any glass container within a speed range of 70 to 240/min. Circle No. **141.**

Package Testing Equipment

Gaynes Engineering Co. offers a catalog containing data sheets on all models of its package testing equipment. Included is data on its vibration testers, incline-impact (conbur) testers, drum testers, and drop testers. Circle No. **142.**

Corrugated Boxes

Hoerner Boxes has a brochure on two new services they are offering to users of corrugated boxes—a product development and engineering laboratory and the services of the National Safe Transit Program. NSTP testing procedures are described and benefits explained. Circle No. **143.**

Paper/Paperboard Silicone Coating

Dow Corning Corp. has published Catalog No. 8-601, describing its silicone coating for paper and paperboard. Product keeps gummy and tacky materials from sticking to bags, boxes, wraps, etc. Coatings will not contaminate, migrate or alter stock. Included are several samples of various grades of paper that have silicone coatings applied to one side. Circle No. **144.**

Printing of collapsible tubes

(*Continued from Page 22*)

or is desired. The best way to indicate this is with an actual printed tube sample. The tube designer frequently wants the same colors on his tubes and cartons. Colors on paper and on metal just aren't quite the same, but a reasonably good approximation can usually be made.

Basis of color choices. There is an almost infinite variety of colors. I have heard it said that there are at least one thousand different whites, so that the selection of colors is a serious problem. A very helpful guide to this problem is contained in the *Color Harmony Manual,* published by Container Corporation of America. This manual contains samples, produced on permanent plastic chips, of approximately a thousand colors. They are reasonably permanent and samples are always available. This leads me to **Rule 6: Be certain there is a clear understanding of the colors desired and provide ample color samples for control purposes.**

Check Your Standards

Color standards should be continually checked and evaluated, particularly where a number of related packages such as the tube in a carton are used by a national distributor and supplies are bought from several manufacturers. Once the colors have been established, it is important to have a means of making sure that the standards themselves do not change color and that the production and quality control departments are referred to up-to-date and accurate color standards. By frequently referring to original approved color standards, the tendency for colors to drift as successive runs of an item are made can be avoided.

Setting tolerances. As with everything else in manufacturing, tolerances in color are essential. In establishing the original color standards, tolerances on the light and dark side are just as important as the standard itself. The best practice for establishing correct color standards and tolerances is to make actual finished samples of the tube in question and make a sufficient number so that they can be used for a long period of time. Standards which have been exposed to light and have been handled frequently may change color and they should be compared with standards which have been adequately protected.

Correcting the causes of package defects

(*Continued from Page 52*)

Occasionally there may be limp film or some blocking up in one corner that retards free movement. It is important to pull as much film as necessary to get a free and even movement and to clear the jam.

Sources of difficulty. If the film is not coming through firmly in the back of the machine, it may mean that it is not being held properly by the series of marbles under which it rolls. If it is not being held properly, the machine cannot wrap it and pull it tight, as should be done. Here again the difficulty may be in the film, not in the machine. This is especially true of uneven film that may be limp and hangs at the edges. The film may not be sufficiently far over to get a good overlap for sealing.

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Packaging Machinery Development Engineer — with heavy experience in design and development of packaging equipment to report directly to vice-president manufacturing of food company with sales over $300 million annually. To modify existing equipment and develop new equipment for seven plants; headquarters in New York area. Work with package development and industrial engineering groups. Salary open. Please reply to Box 701, **Package Engineering,** 185 N. Wabash Avenue, Chicago 1, Illinois.

FOR SALE

For Sale — Late Model Lynch Wrap-O-Matic Bar Wrapper — will resize to your product. Rebuilding and resizing Wrap-O-Matics Our Specialty. New Dietz Electric Eye and Cut Off Controls in stock. Reply to Coffman Manufacturing Corp., P. O. Box 372, Cary, Illinois.

For Sale — Hayssen Wrapping Machine, Serial No. 11421, Model 4-10. Equipped with electric eye and chute. Used in the textile trade. Reason for selling: We are switching from cellophane to polyethylene wrapping. The machine is in excellent condition. It was purchased new in 1955. Make inquiries to: Alpha Mills Corporation, Schuylkill Haven, Pennsylvania.

For Sale — Cartoner Machine CECO Model 40 (Container Equip. Corp.), 9-1/2 GG 2 Station Adjustable. Glue seals a dry seal end style carton. Brand-new condition, less than 1 yr. use. Direct inquiries to LITHO DIVISION, Milprint, Inc., Milwaukee, Wis.

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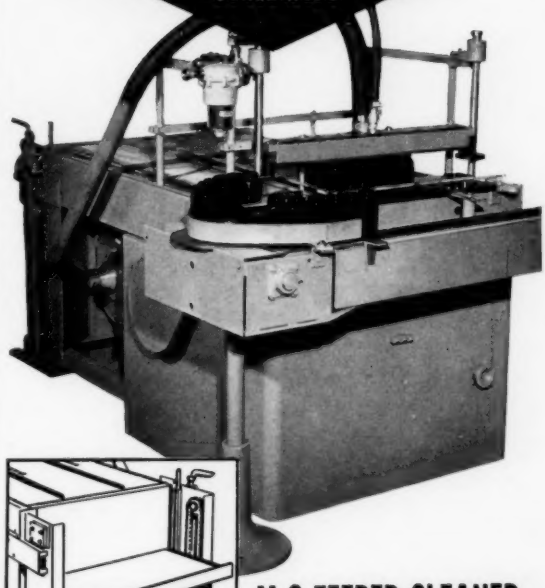

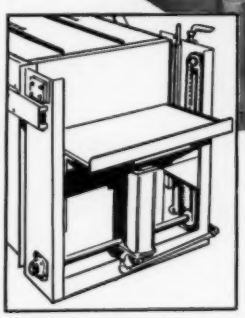

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What we think

Machine manuals: Keys to cost cutting

Whether prompted by a recession or simply by the dictates of good practice, we all look for ways to cut our costs. If somebody showed up at our door stating that he could (1) eliminate many machinery service calls, (2) cut our downtime and loss of production, (3) hold down our starting-up expense, and (4) minimize wear and tear on our key *people*, we would welcome him in.

However, alert users of packaging machinery know that he is already in. It merely remains for a user to make the most of what he has to offer. We refer to no mysterious stranger, but rather to the manual accompanying a unit of packaging machinery.

Stumbling blocks to effective use of manuals

There are many reasons why users don't get as much as they should from their machinery manuals. Sometimes these valuable books are thrown out with the wrappings. Sometimes they get buried in the files or are routed to the wrong people. Traditional American reluctance to read the fine print is another factor. Some mechanics have had disappointing experiences with inadequate manuals and are prejudiced against all of them.

We know that some manuals fall short of doing the job, but at the same time, we think most machinery manufacturers are seeking to turn out better manuals. Most of them are keenly aware of what a good manual should be. Articulate users who know what to expect from a manual can prod the laggard manufacturers into turning out better books. So just for discussion, let's assume these manuals are properly written and illustrated.

A clearly written manual with properly prepared exploded-view drawings is a joy to behold. The mechanic can follow it easily and can even use it when getting advice on the telephone. He can save many a service call by reading the manual carefully and using it to ask the correct questions of his suppliers. (Note that we said "exploded-view drawings." These are easy to follow in contrast to unwieldy, hard-to-read blueprints which practical mechanics seldom follow as they dissemble and reassemble machinery).

Most of us are quite manual-conscious at home. Long ago we learned to adjust the cutting height of a new lawn mower by following the description in the manual. We have learned to cope with rather intricate hi-fi equipment the same way. Even though we couldn't solve our gas range problem, at least we took some comfort from orienting the problem with the aid of a manual. We stood in awe as a friend of ours (an accountant, interestingly enough) almost single-handedly remodeled his home, doing competent electrical work, carpentry, and plumbing simply by reading well prepared manuals. His work evidently passed the scrutiny of a conscientious building inspector in his politically incorruptible suburb.

Applying these ideas to packaging machinery, these same advantages should accrue—providing the manuals get into the hands of the right people and that these folks learn to make the most of what the manuals have to offer. Many experts have reminded us of what a good manual should contain. Those who do not get such manuals should insist on having them.

Skilled users and suppliers alike say they cannot overestimate the value of exploded-view drawings. Also, they suggest full information on dismantling and reassembling, machinery and part descriptions, timing charts, wiring details, lubrication information, adjustment pointers, and data on routine maintenance. Further, they urge a review of typical troubles or difficulties and their solutions. Also, they make sure that the manual was revised as the machinery was improved, so that no one has to try to apply an obsolete manual to a current machine.

Workable use of "do-it-yourself" practices

Perhaps users rely too much on the availability of servicemen and supplier representatives. We think that if a mechanic could assume mentally that he is 5,000 miles from a serviceman, he would read the manual carefully and do all he could himself to correct his difficulties and hold his lost time to a minimum. Service calls are costly enough, but far more expensive is the downtime and loss of production.

All in all, it pays dividends to make the mechanics manual conscious and to see that they make the most of the valuable information these books contain.

Bruce Holmgren

Editor

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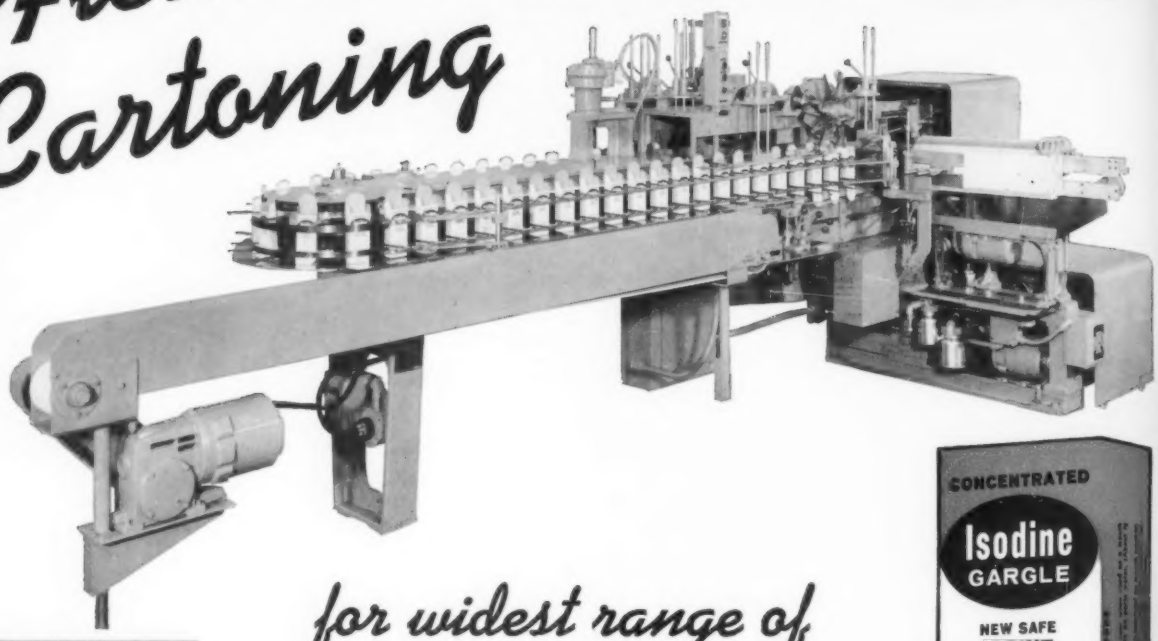

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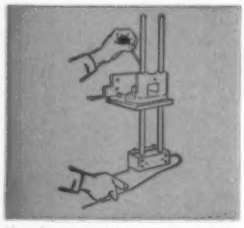

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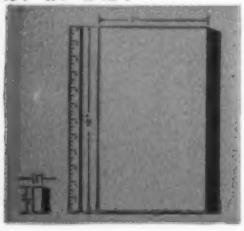

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